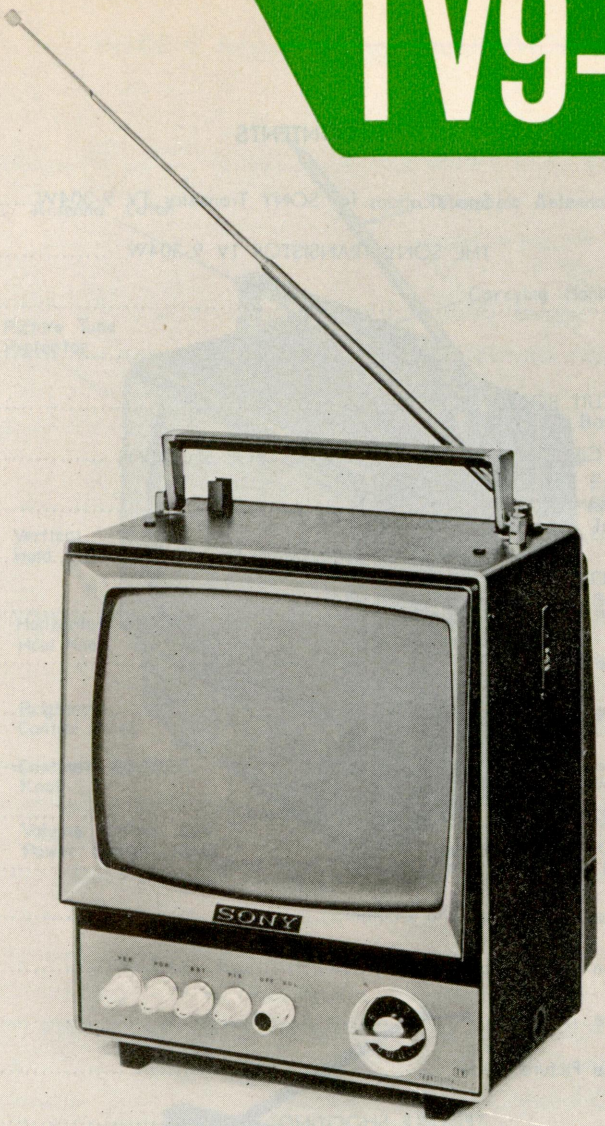
TV9-304W



Specifications

Picture Tube :	9″, 90° Deflection, Aluminized Screen
Transistor :	27
Diode :	14 and 4 Selenium Rectifier
Channel Coverage :	A2 . . . A13
Maximum Sensitivity :	10μV (10Vpp at Picture Tube Cathode)
IF Circuit :	4 Stages with 5 stagger tuned elements
	Video IF 26.75 Mc, Sound IF 22.25 Mc, Bandwidth 3.0 Mc/—3dB
Resolution :	Vertical 400 Lines, Horizontal 300 Lines
Sound System :	4.5 Mc Intercarrier System
	Power Output Stage OTL System 300 mW
	Speaker 2-3/4″ × 4″ Oval Type, 40Ω Voice Coil
Automatic Control :	Ultra-linear AGC, Pulse-operated AGC, Diode AFC
Power Requirement :	AC 117V, 50 or 60c/s, DC 12V Battery (3.5 AH)
Power Consumption :	AC 15W, DC 10.8W (0.96A)
Dimensions :	8-5/8″ (W) × 9-5/8″ (H) × 7-3/8″ (D)
Weight :	12 lbs. 11 ozs.
Glare Proofing :	Smoked Filter, 65% Transparency

SONY®

SERVICING GUIDE

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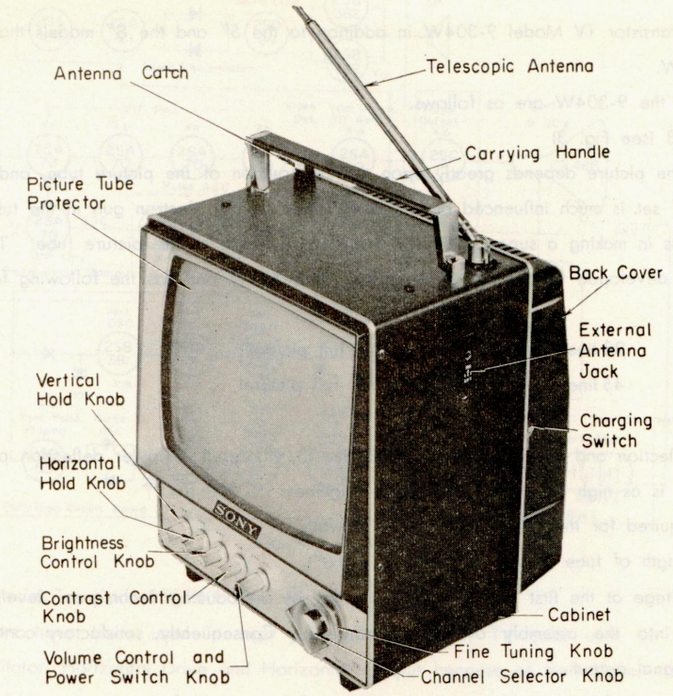
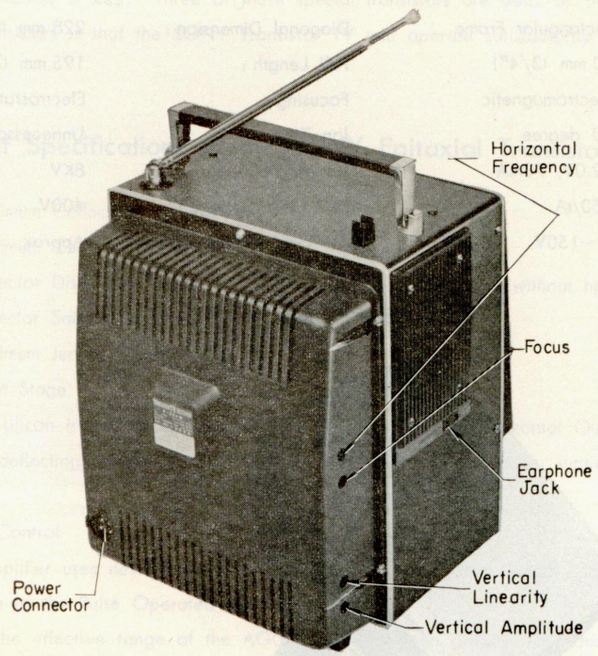


(Fig. 1)



(Fig. 2)

The SONY Transistor TV Model 9-304W

General

SONY presents a 9″ Transistor TV Model 9-304W in addition to the 5″ and the 8″ models that are well known as 5-303W and 8-301W.

The general features of the 9-304W are as follows.

1 Picture Tube CT468 (see Fig. 3)

The resolution of the picture depends greatly upon the construction of the picture tube, and the power consumption of the TV set is much influenced by the construction of the electron gun in the tube. Therefore, the key point in success in making a superior TV set is the improvement of the picture tube. The CT468 picture tube was specially developed for the SONY Transistor TV 9-304W and has the following features.

a) Resolution

Horizontal	28 lines per cm. (300 lines for full picture)
Vertical	45 lines per cm. (400 lines for full picture)

b) Deflection power

90 degree deflection and a neck diameter of 20 mm (3/4″) result in lower deflection power although the anode voltage is as high as 8 KV. This gives brightness of 500 lux.

c) The power required for the heater is less than 1 watt.

d) The overall length of tube is only 195 mm (7-11/16″).

e) The cut-off voltage at the first grid is made very low by introducing techniques developed in transistor manufacturing into the assembly of the electron gun. Consequently, satisfactory contrast is obtained at lower video signal output.

f) The square corners of the tube give a larger picture for the size of the tube.

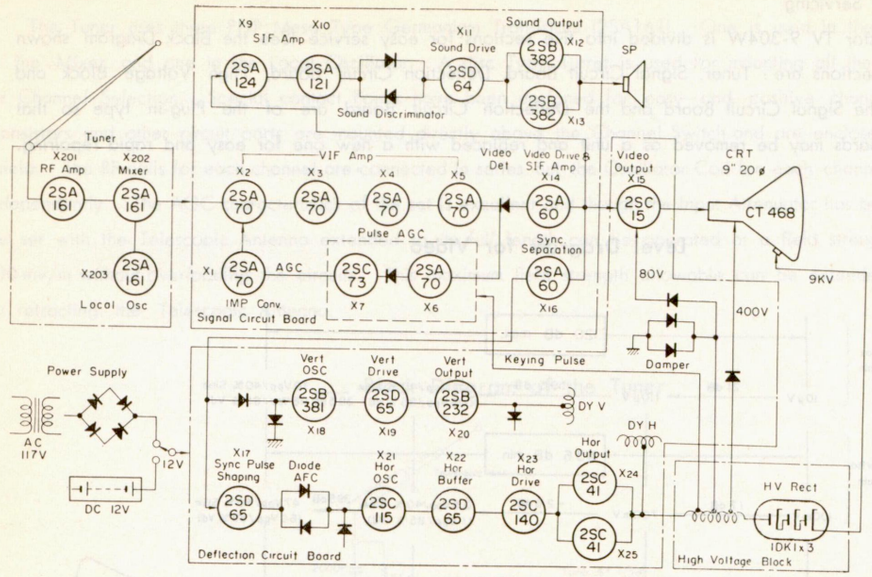
Specifications of Picture Tube CT468

Type :	Rectangular Frame	Diagonal Dimension :	228 mm (9″)
Neck Diameter :	20 mm (3/4″)	Full Length :	195 mm (7-11/16″)
Deflection :	Electromagnetic	Focusing :	Electrostatic Automatic
Deflection Angle :	90 degree	Ion Trap :	Unnecessary
Heater Voltage :	12.0V, 70mA	Anode Voltage :	8KV
Anode Current :	150μA	2nd Grid Voltage :	400V
Focusing Voltage :	0—150V	1st Grid Cut-off Voltage :	Approx. —35V

Picture Tube

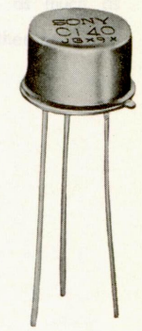
(Fig. 3)

Block Diagram



(Fig. 4)

Silicon Epitaxial Transistor



(Fig. 5)

2. The SONY Epitaxial Transistor 2SC140 (See Fig. 5)

Silicon transistors have been used in high powered circuits in TV sets, such as Video Output Stage, Horizontal Oscillator, Horizontal Drive and Horizontal Output because of their higher working voltage, stable operation at high temperatures and lower I_{CBO} (low leakage current). The disadvantage has been that the internal resistance (Collector Saturation Resistance, Rs) was high (app. 70Ω) causing high power consumption. The new SONY Epitaxial Transistor of the Mesa Silicon Type was developed to overcome this disadvantage. The Rs of the 2SC140 is 2Ω. Three of these special transistors are used in the 9-304W. One result of use of these transistors is that the SONY Transistor TV will operate satisfactorily at an ambient temperature of 35°C (95°F)

Brief Specifications of the SONY Epitaxial Transistor 2SC140

Maximum Collector-Base Voltage :	60V
Maximum Collector Current :	1 A
Collector Dissipation (Max.) :	1.7W (without heat sink)
Collector Saturation Resistance :	2Ω
Maximum Junction Temperature :	175°C

3. Horizontal Output Stage

Two Mesa type silicon transistors of Type 2SC41 are used for the Horizontal Output Stage to give sufficient margin to the deflecting power. With the help of two Damper Diodes, superior linearity of the picture is obtained.

4. Automatic Gain Control

The Video IF Amplifier uses newly developed Ultra-linear AGC System which includes Impedance Converting Stage in addition to the Pulse Operated AGC System.

As the result, the effective range of the AGC action has been greatly expanded to give satisfactory performance even when an extremely strong signal is received.

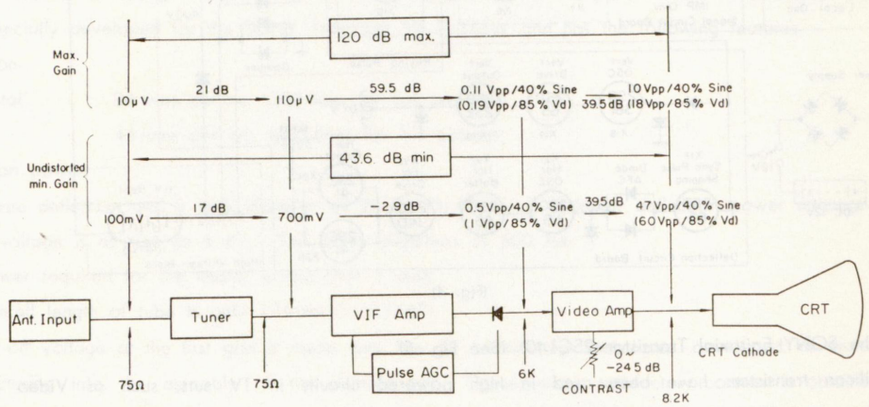
5. Facility for attaching UHF Converter

SONY UHF Converter can be attached to the 9-304W in a quite simple manner.

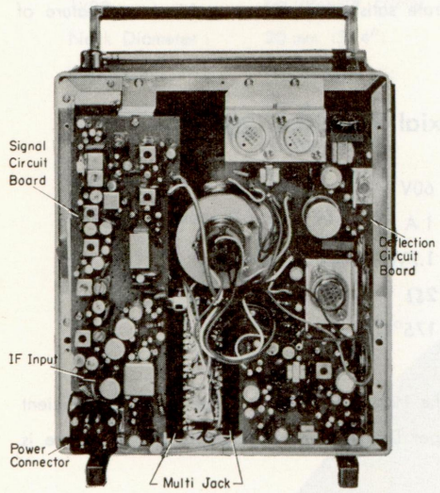
6. Provision for Easy Servicing

The SONY Transistor TV 9-304W is divided into five sections for easy service (See the Block Diagram shown in Fig. 4). The sections are : Tuner, Signal Circuit Board, Deflection Circuit Board, High Voltage Block and Power Supply. The Signal Circuit Board and the Deflection Circuit Board are of the Plug-in type so that either of these Boards may be removed as a unit and replaced with a new one for easy and rapid repairing.

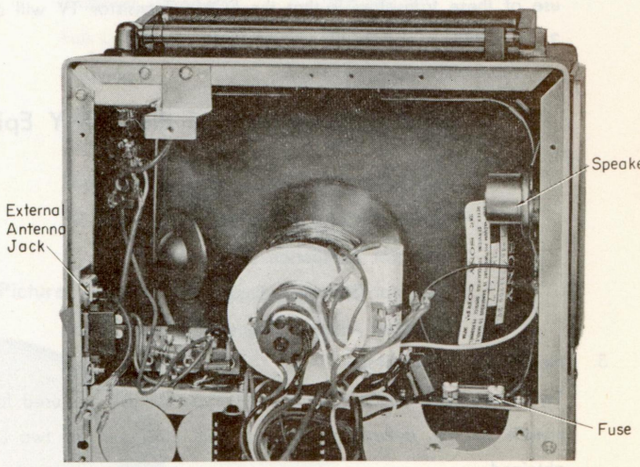
Level Dragram for Video



(Fig. 6)



(Fig. 7)

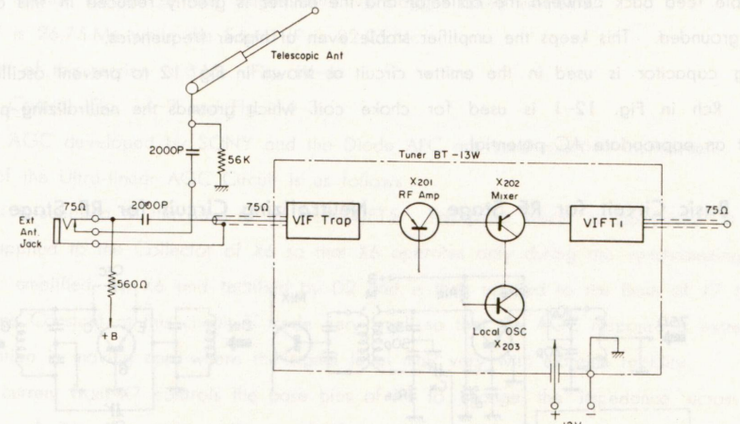


(Fig. 8)

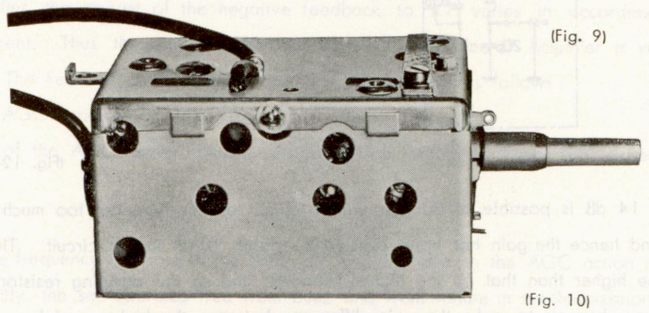
The Tuner

The Tuner uses three PNP Mesa Type Germanium Transistors (2SA161). One is used in the RF Amplifier, one in the Mixer and one in the Local Oscillator. A disc Type Turret is used for mounting all the coils and contacts for Channel Selection. Special contact Points have been designed for easy and positive channel selection. The Transistors and other circuit parts are mounted directly above the Channel Switch and are enclosed within the Tuner Shield. The RF coils for each channel are connected in series but the Oscillator Coil for each channel can be adjusted independently. The AGC characteristics of the set is excellent and though the Input Attenuator has been dispensed with, the set with the Telescopic Antenna extended to its full length can be operated at a field strength of as much as 100 mv/m without overloading the circuits. This maximum field strength allowable can be extended further to 1 v/m by retracting the Telescopic Antenna.

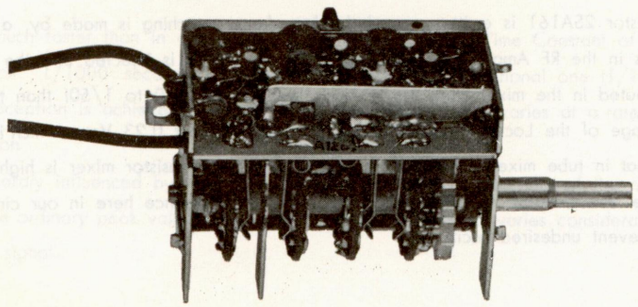
Block Diagram of the Tuner



(Fig. 9)



(Fig. 10)



(Fig. 11)

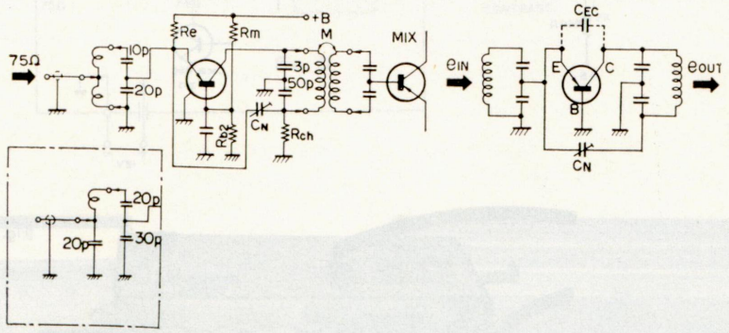
1. The RF Amplifier

The Antenna Impedance is low (75Ω) and the Input Impedance to the RF Transistor is also low. Between the Antenna and the Transistor Input is tuned circuit of which the resonant impedance is from 1 K to 4 K ohms. Taps are used on both sides of the Tuned Circuit for correct impedance matching which is very important. A tap on the inductance is made on the Antenna side and a tap is made on the Capacitance on the Transistor side for the impedance matching. The RF Transistor Cutput Circuit is double tuned with mutual coupling (Double Peaks). This in combination with the single peak of the input circuit gives an essentially flat Bandwidth of 6 Mc for this stage. A Base-grounded Circuit is used for the following reasons.

1) The difference in gain between the lower frequencies and the higher frequencies is less in the Base-grounded Circuit.
2) The adjustment of neutralizing capacitance is very critical in the emitter-grounded circuit so that stability is reduced.
3) The Base-grounded Circuit with transistor corresponds to the grounded-grid circuit with vacuum tube. The undesirable feed back between the collector and the emitter is greatly reduced in this circuit because the base is grounded. This keeps the amplifier stable even at higher frequencies.

A neutrlizing capacitor is used in the emitter circuit as shown in Fig. 12 to prevent oscillation due to stray capacitance. Rch in Fig. 12–1 is used for choke coil which grounds the neutralizing point for DC while keeping it at an appropriate AC potential.

Basic Circuit for RF Stage



(Fig. 12–1)

Neutralizing Circuit for RF Stage

(Fig. 12–2)

A gain of 14 dB is possible at 200 Mc with a circuit of this type but too much gain tends to make the set unstable and hence the gain has been kept to be about 10 dB in our circuit. The gain on the lower channels tends to be higher than that on the higher channels, and so the damping resistors are inserted in the circuit of the lower channels to make the gain difference between the higher and lower channels within ±1.5 dB.

2. The Mixer Circuit

The Mixer Transistor 2SA161 is emitter-grounded. Impedance matching is made by a capacitance divider in the same way as in the RF Amplifier. The Local Oscillator signal is injected into the base of the transistor. The power dissipated in the mixer transistor is much less (about 1/30 to 1/50) than the plate loss of the tube mixer. The voltage of the Local Oscillator signal injected is about 0.23 Vrms, which is also much smaller (1/10 to 1/20) than that in tube mixer. Furthermore, the Gm of the transistor mixer is high and hence the troubles with mixer noise encountered in tube circuit are of no consequence here in our circuit. This circuit is also neutralized to prevent undesired oscillation.

3. The Local Oscillator

The Local Oscillator uses Colpit Circuit. This circuit is well suited for this use as it does not require a tap on the oscillator coil. The transistor (2SA161) is base-grounded. The thermistor in the base circuit serves to prevent oscillator drift due to temperature changes. The drift is kept within 200 Kc. As mentioned before, each oscillator coil is independent of the others so that the oscillation frequency can be adjusted from outside the tuner by adjusting the screw type cores. The cylindrical Fine Tuning Capacitors are separately shielded to prevent radiation from the set. The adjustable range of the Local Oscillation is approx. 1.6 Mc for Channel 2 and 3 Mc for Channel 13.

Signal Circuit Board Section

The Signal Circuit Board includes the Video IF, AGC, Sound Amplifier, Video Drive and Synchronizing Pulse Separation circuits. (Fig. 13)

1. Video IF Section

* The Video IF Section consists of four stages with five stagger tuned elements.
* The Video IF is 26.75 Mc while the Sound IF is 22.25 Mc.
* The bandwidth of this section is 3 Mc. (Fig. 14–1)

2. Automatic Gain Control (Fig. 14–2 and Fig. 14–3)

The Ultra-linear AGC developed by SONY and the Diode AFC are used together in this set.

The operation of the Ultra-linear AGC Circuit is as follows :

The AGC signal is supplied to the Base of X6 from VIFT5. The pulse which is generated at the Fly Back Transformer is applied to the Collector of X6 so that X6 operates only during the synchronizing period. The AGC signal is amplified by X6 and rectified by D2 and is then applied to the Base of X7 through a Filter Circuit. The Time Constcnt at this circuit is made very small so that the AGC response is extremely fast, thus permitting operation in moving cars where the signal level may vary with extreme rapidity.

Then the AGC current from X7 controls the base bias of X1 to change the impedance across the collector and the emitter of X1. Since the collector of X1 is connected in series with the emitter of X2 in the first stage of the Video IF Amplifier, the amount of the negative feedback to X2 varies in accordance with the variation of the AGC current. Thus the gain at the first stage of the Video IF Amplifier is varied as the input signal level changes. The Features of the Ultra-linear AGC System are as follows :

* Wider effective range of AGC action

  Expanded effective range of the AGC action permits distortion-free recepticn under an extremely strong input signal.

* Stabler reception

  The tendency of drift in the frequency response of the Video IF Amplifier due to the AGC action is eliminated in this system. Consequently, the set operates free from buzz and from failure in synchronization which may result from the distortion of the wave form in the Video IF Amplifier when an extremely strong signal is received.

* Quick response

  The AGC action is much faster than in conventional circuits because the Time Constant of the filter circuit is very small (approx. 1/1000 second) compared to that in the conventional one (1/10—1/20 second). Accordingly, stable reception is achieved even when the input signal level varies at a rate of 1/100 second.

* Noise free AGC action

  The AGC action is hardly influenced by noise since the synchronizing pulses only of the Signal are utilized. On the contrary, in the ordinary peak value AGC system, the AGC voltage varies considerably with the noise content of the video signal.

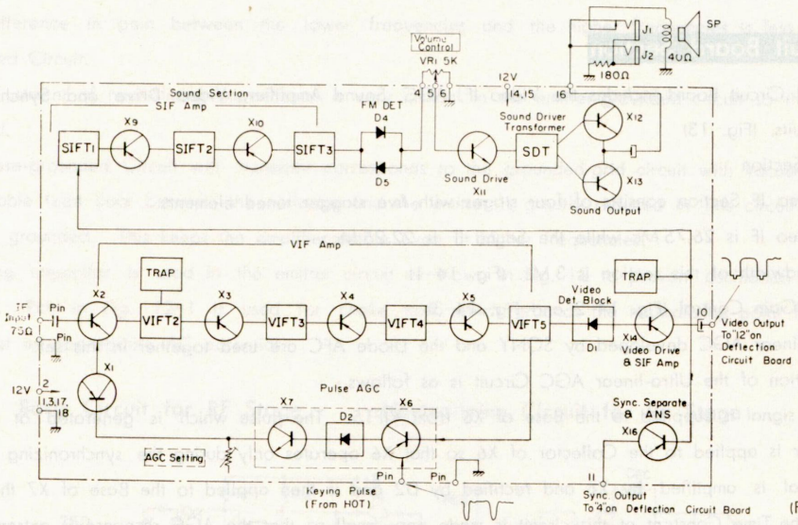
* Effective AGC action

  The AGC action is quite effective due to higher gain in the AGC loop. Stability against the variation of the temperature and of the power supply voltage is secured also.

3. Sound Amplifier Section

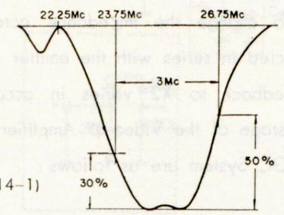
The Sound Amplifier Section has two IF stages, Ratio Detector and two Audio Amplifier Stages. However, the IF Amplifier can be considered substantially consisting of three stages because the Video Drive Stage works as a SIF amplifier also. The Cutput Stage uses the SEPP-OTL (Single Ended Push-pull No Output Transformer) system. The speaker size is 2-3/4″×4″ and its impedance is 40Ω. There is a shield plate on SIFT3 to prevent the pulse from the Picture Tube Deflection Yoke to interfere with the scund. The maximum output is 300 mW.

Block Diagram of Signal Circuit Board



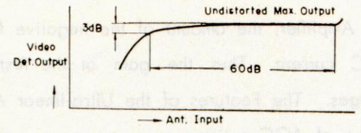
(Fig. 13)

VIF Freq. Response

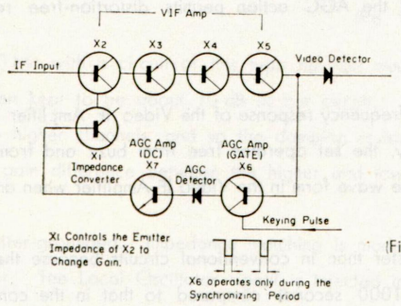


(Fig. 14-1)

AGC Characteristics



(Fig. 14-2)



(Fig. 14-3)

4. Video Driver

The Video Driver Circuit is of the Emitter Follwer Type (Collector Grounded). The Output Impedance is very low and this circuit has good frequency characteristics. The Video Signal Synchronizing Pulse are separated at the Emitter of X14.

5. Synchronizing Pulse Separation

The Sychronizing Pulse is separated at the diode consisting of the Emitter and the Base of X16 and is taken from the collector of the same transistor. This stage includes the ANS (Automatic Noise Suppressor) for the synchronizing pulse. This permits stable operation of the set in a car without fear of interference from the ignition sparks and other pulsive noises.

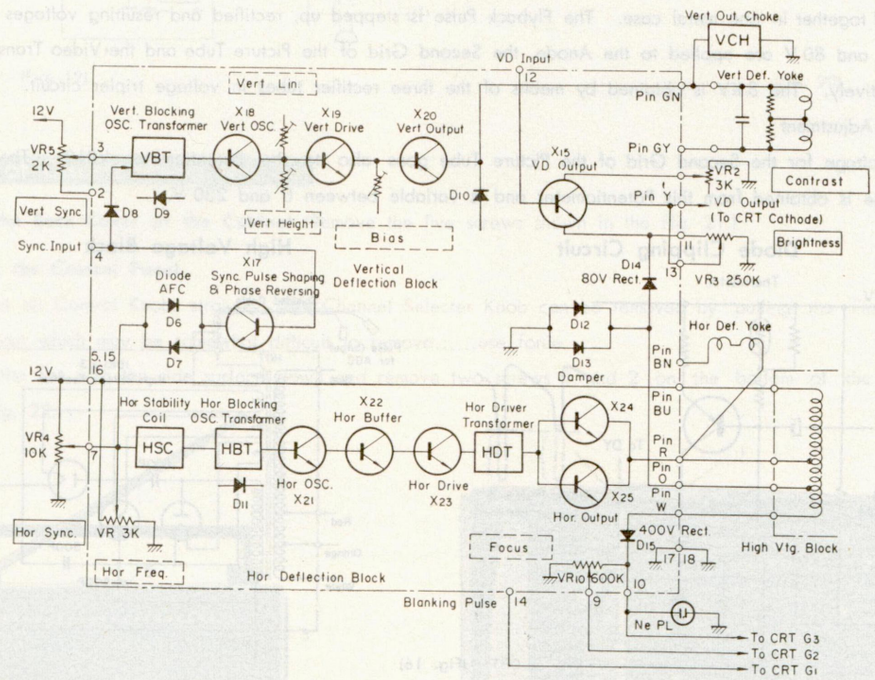
Deflection Circuit Board and High-Voltage Block Sections

The Deflection Circuit Board contains the Video Output and the Vertical and Horizontal Deflection Circuits.

1. Video Output Circuit (Fig. 15)

A Mesa Type Silicon Transistor 2SC15 (X15) is used in the Video Output Circuit. Over 50 Vpp of output is obtained from this circuit by supplying 80 Volts to the collector of X15. The Picture Tube requires 30 Vpp for sufficient contrast. The Contrast Control is obtained by varying the feedback current by means of the Variable Resistor VR2 which is located in the Emitter Circuit of X15. The gain of the stage can be varied by 24 dB with this control. The frequency response is almost flat to 3 Mc by the use of Shunt-peaking (L501—R508) and Series-peaking (L502—R509). Since the Video IF Bandwidth is 3 Mc and the beam spot of the Picture Tube is very small, a very sharp picture is obtained. The Horizontal resolution is more than 300 lines and the Vertical 400 lines. X15 is cut-off during Horizontal Blanking Period by the application of pulse from the Horizontal Deflection Circuit. The Horizontal Blanking Pulse is applied to the Emitter of X15 while the Vertical Blanking Pulse is applied to G_1 of the Picture Tube.

Block Diagram for Deflection Block



(Fig. 15)

2. Vertical Deflection Section (Fig. 15)

The Vertical Deflection Sawtooth Wave is generated by blocking oscillations in the circuit of X18. It is then amplified by X19 and X20 and applied to the Vertical Deflection Yoke of the Picture Tube. Vertical Amplitude and Linearity are adjusted by Variable Resistors VR7 and VR8 in the Base Circuit of X19. The Back Pulse is suppressed by a Clipping Circuit using a diode D10 in the collector circuit of X20, the Vertical Output Transistor. The pulse is taken out at the terminal of D10.

The heat generated in X20 is dissipated through a large heat sink and the variation of the characteristics due to the temperature difference is compensated by the thermister located in the Base Circuit of X20.

For the effective compensation, the thermister is placed in the cavity provided on the bottom of X20.

The Variable Resistor VR9 in the Base Circuit of X20 serves to adjust the operating point of X20 and it is not necessary to re-adjust except when X20 is replaced.

3. Horizontal Deflection Section

The Horizontal Deflection Pulse is generated by Blocking oscillation in the circuit of X21 and is amplified by X23 which drives X24 and X25. X24 and X25 generate the Sawtooth Wave which drives The Horizontal Deflection Coil. The Horizontal Output Transistors (X24 and X25) are also connected to the Horizontal Output Transformer and supply the input for the High Voltage Circuit with the Flyback Pulse during Cut-Off. All of the transistors except X22 in the Horizontal Deflection Circuit are of the Silicon Type. This assures stable operation almost free from temperature effects.

Two diodes (D12 and D13) connected to the tap of the Horizontal Output Transformer operate as damper to improve the linearity of the wave form which has tendency of being affected by high collector saturation resistance in the silicon transistors.

The capacitor C815 connected in series with the Horizontal Deflection Coil serves to compensate the deflection current to correct the deterioration of the linearity due to the curvature of the fluorescent screen of the Picture Tube. For AFC, the negative pulse is taken from the collector of X23, the Horizontal Driver, and is integrated after delayed by L601. The Sawtooth Reference Wave obtained through this process is applied to the Base of X21 to control the blocking oscillation.

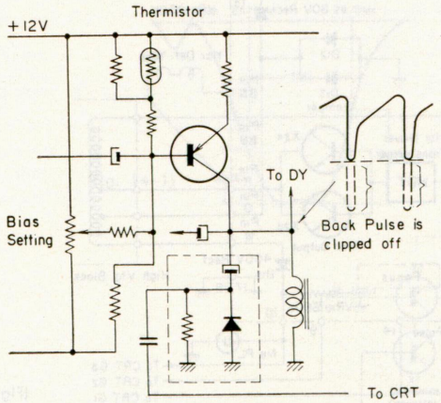
4. High Voltage Block

The High Voltage Block consists of the Horizontal Output Transformer and the High Voltage Rectifier. All are housed together in one metal case. The Flyback Pulse is stepped up, rectified and resulting voltages of 8 KV, 400 V and 80 V are applied to the Anode, the Second Grid of the Picture Tube and the Video Transistor (X15) respectively. The 8 KV is obtained by means of the three rectifier tubes in voltage tripler circuit.

5. Focus Adjustment

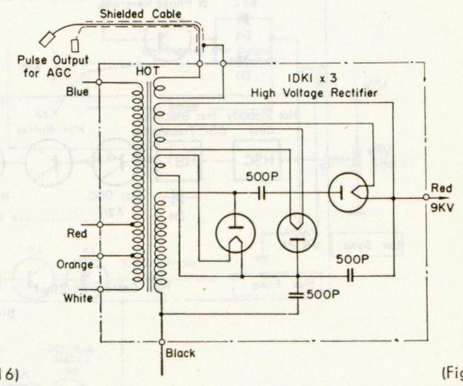
The voltage for the Second Grid of the Picture Tube goes also to the Potentiometer VR10. The Focusing Voltage is obtained from this Potentiometer and is variable between 0 and 230 V.

Diode Clipping Circuit

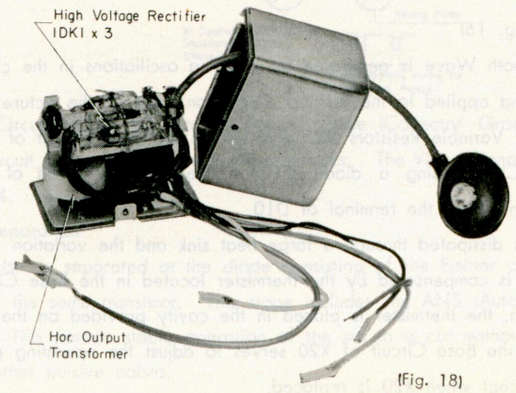


(Fig. 16)

High Voltage Block



(Fig. 17)

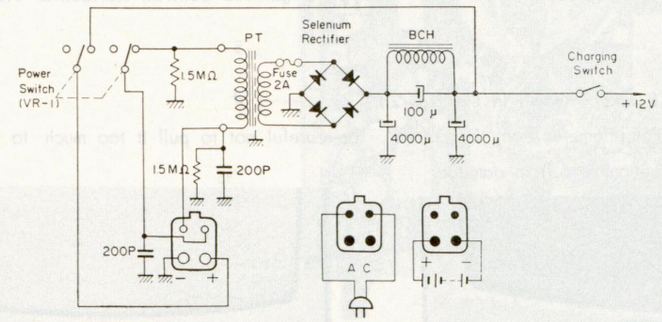


(Fig. 18)

Power Supply Section

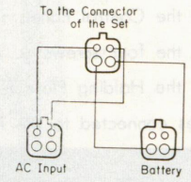
117 V AC is converted to 12 V DC by four Selenium Rectifiers in a Bridge Connection as shown in Fig. 19. Power Transformer with oriented core is used in this set to prevent any trouble from Leakage Flux. The primary winding of Power Transformer is grounded to the chassis through two 1.5 M Ω resistors in accordance with the safety measure provided in the specifications LA, CSA etc. of the United States and Canada. Accordingly, one may feel a slight electrical shock when he touches the Cabinet of the set operated with AC Power Supply. This is harmless and is not to be mistaken as an indication of trouble with the set.

Connection of Power Supply Section



(Fig. 19)

Charging Adapter



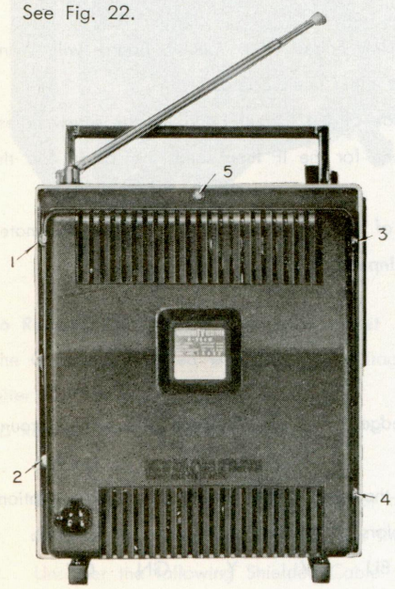
(Fig. 20)

Method of Disassembling the Set

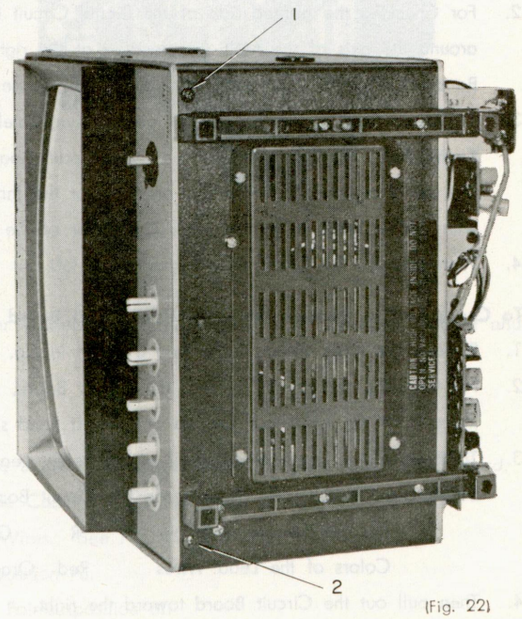
To Open the Back Cover of the Cabinet (Remove the five screws shown in the Fig. 21.)

To Remove the Control Panel

1. Pull out all Control Knobs straight. The Channel Selecter Knob can be removed by pulling the Fine Tuning Knob out which may be somewhat difficult to remove.....use force.
2. Place the Set with the side surface down and remove two screws 1 and 2 on the bottom of the Cabinet. See Fig. 22.



(Fig. 21)



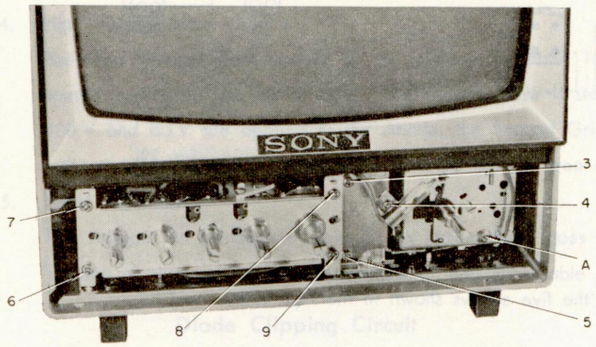
(Fig. 22)

To Remove the Tuner

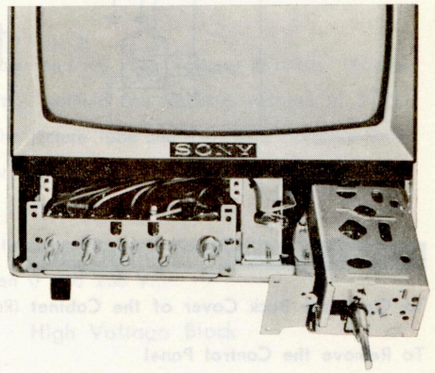
1. Open the Back Cover of the Cabinet.
2. Unsolder the Shielded Cable extended from the Tuner at the bottom of the Telescopic Antenna behind the Signal Circuit Board.
3. Unsolder the Red Wire (power supply to the Tuner) at the point A shown in Fig. 23.
4. Remove the three screws 3, 4 and 5 shown in Fig. 23. The screw 4 is used to secure the Neon Lamp Holder also.
5. Pull out the Tuner from the Cabinet. See Fig. 24.

To Remove the Potentiometers for Volume Control, Contrast Control, Brightness Control, Horizontal Hold and Vertical Hold

1. Remove the Control Panel.
2. Remove the four screws 6, 7, 8 and 9 shown in the Fig. 23.
3. Pull out the Holding Plate for Potentiometer from the cabinet. Be careful not to pull it too much to prevent the wires connected to the Potentiometers from damage.



(Fig. 23)



(Fig. 24)

To Check and to Remove the Signal Circuit Board

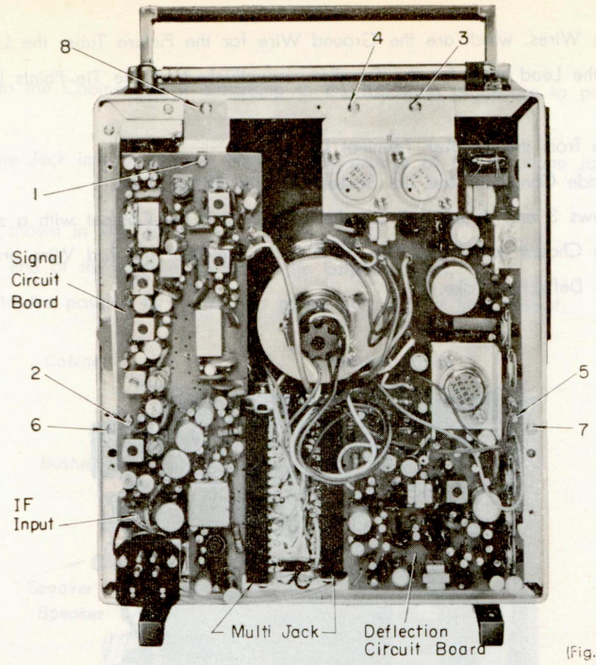
1. Remove the two screws 1 and 2 shown in Fig. 25.
2. For Checking the printed side of the Signal Circuit Board, pull its left edge. The Circuit Board will swing around the axis of the Multi-jack located at the right hand side of the Circuit Board.
   Be careful not to lose two small rubber cushions on the printed side of the Circuit Board at the screw holes.
3. To Remove the Circuit Board, pull out the two Shielded Cables, one for the IF Input and the other for the Keying Pulse Input, from the pins on the Circuit Board.
   The pin designated with the Red Mark is for the Inner Conductor of the IF Input Cable while the one designated with the + Mark is for the Inner Conductor of the Keying Pulse Input Cable.
4. Then pull out the Circuit Board toward the left.

To Check and to Remove the Deflection Circuit Board

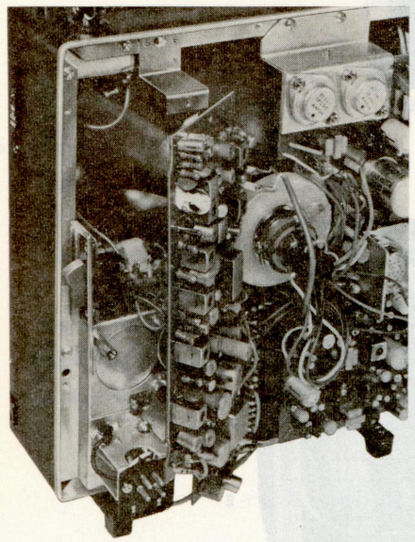
1. Remove the three screws 3, 4, and 5 shown in Fig. 25.
2. For Checking the printed side of the Circuit Board, pull its right edge. The Circuit Board will swing around the axis of the Multi-jack located at the left hand side.
3. To Remove the Circuit Board, pull out the eight Lead Wires from the pins on the Circuit Board. The relations between the marking for the pins on the Circuit Board and the colors of the Lead Wires are as follows :

Marking for the pins	R	O	BN	BU	W	Y	GN	GY
Colors of the Lead Wires	Red	Orange	Brown	Blue	White	Yellow	Green	Gray

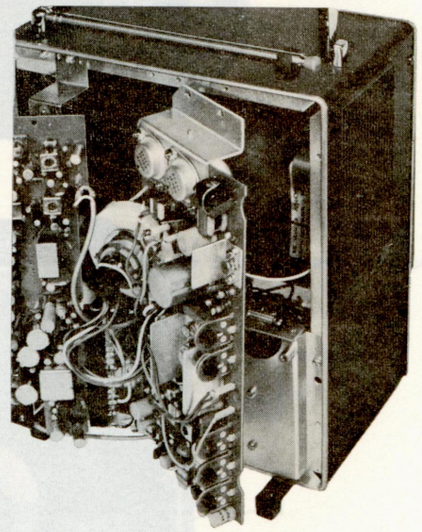
4. Then pull out the Circuit Board toward the right.



(Fig. 25)



(Fig. 26)



(Fig. 27)

To Remove the Chassis from the Cabinet

The Chassis is mounted with the High Voltage Block, Power Transformer, Filter Choke Coil, Selenium Rectifier and Filter Condensers.

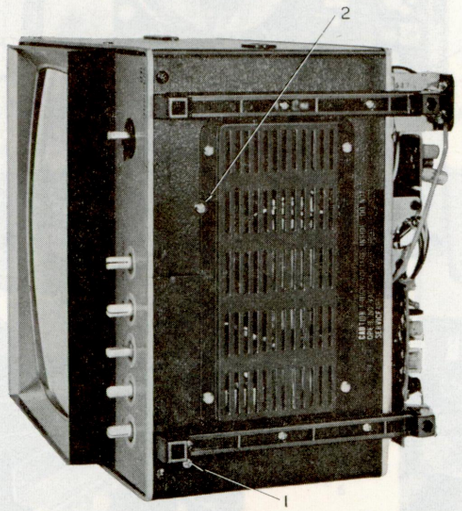
To Remove the Chassis

1. Pull out all the Control Knobs.
2. Open the Back Cover of the Cabinet and Remove the Signal Circuit Board and the Deflection Circuit Board.
3. Remove the two screws 1 and 2 on the bottom of the Cabinet. See Fig. 28.
4. Unsolder the following Shielded Cable and the Lead Wires. See Fig. 29.
   a. Shielded Cable from the External Antenna Jack (position A).
   b. Brown Wire (Power Supply) from the 5 pole Tie Points (position B).

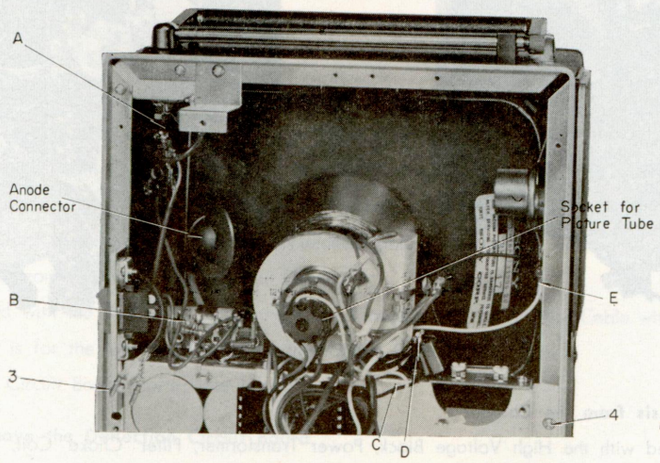
c. Three Black Wires, which are the Ground Wire for the Picture Tube, the Lead Wire for the High Voltage Block and the Lead Wire for the Speaker respectively from the Tie Points located near the Fuse (position C and D).

d. White Wire from the Speaker Terminal (position E).

5. Pull out the Anode Connector and the Socket from the Picture Tube.
6. Remove the screws 3 and 4 and pull out the Chassis from the Cabinet with a slight lifting motion.
7. To separate the Chassis completely from the Cabinet, unsolder the Red Wire and the Green Wire from the terminals on the Deflection Yoke.



(Fig. 28)



(Fig. 29)

To Remove the High Voltage Block

Remove the two Philips screws beneath the Multi-jack for Deflection Circuit Board.

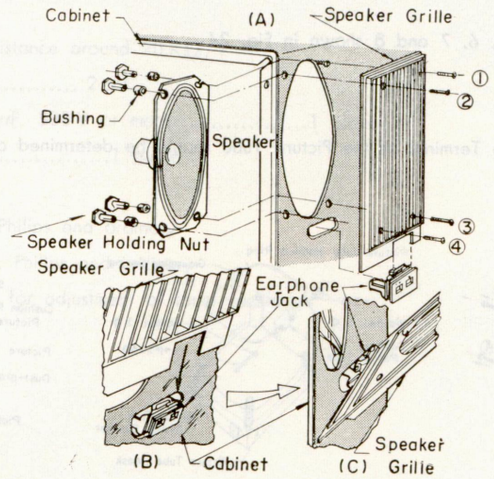
To Remove the Speaker (See Fig. 30)

1. Remove the four screws 1, 2, 3 and 4 while holding the Speaker with hand.
2. Remove the Speaker Grille by pushing it straight up to disengage from the Earphone Jack. The Speaker can be removed together with the Earphone Jack.

NOTE :

To attach the Speaker Grille to the Cabinet, do it according to the following procedure to prevent the Earphone Jack from being damaged.

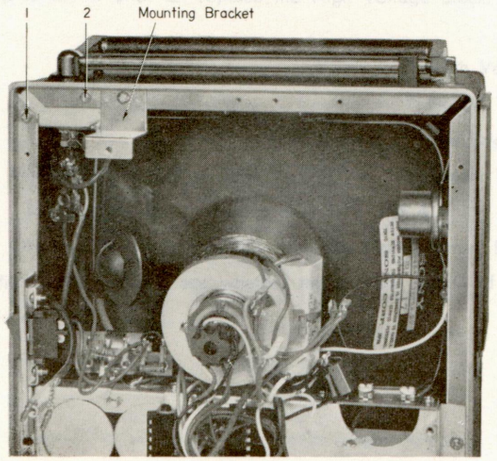
1. At first, insert the Earphone Jack into its position matching the groove of the Earphone Jack to the edge of the hole on the Cabinet.
2. Tilt the Earphone Jack as shown in Fig. 30–B.
3. Fit the gain at the lower end of the Speaker Grille to the Earphone Jack.
4. Bring the Speaker Grille to the position by pushing its upper part against the Cabinet.



(Fig. 30)

To Remove the Telescopic Antenna

1. Open the Back Cover of the Cabinet.
2. Remove the Signal Circuit Board and its Mounting Bracket.
3. Unsolder the Shielded Cable extended from the External Antenna Jack and the 56 Ω Resistor at the bottom of the Telescopic Antenna.
4. Unsolder the Black wire at the grounding tip of the Mounting Bracket.
5. Remove the two screws 1 and 2 in the Fig. 31.
6. Pull the Telescopic Antenna down.



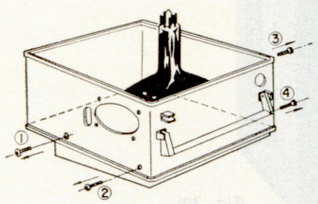
(Fig. 31)

To Remove the Picture Tube (see Fig. 32)

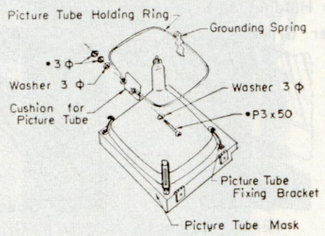
1. Remove the Chassis from the Cabinet.
2. Remove the Deflection Yoke by loosening the screw located on the brass Securing Band.
3. Place the Set with its front side down. This is quite important to prevent the Picture Tube from damage due to accidental drop that might happen in the following step.
4. Remove the four screws 1, 2, 3 and 4 shown in Fig. 32.
5. Lift the Cabinet and the Picture Tube will remain on the table together with the Mask.
6. Remove the Picture Tube Holding Ring from the Picture Tube by loosening the screw and the nut shown in Fig. 33.
7. Remove the four screws 5, 6, 7 and 8 shown in Fig. 34.

NOTE :

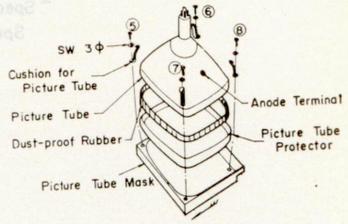
The position of the Anode Terminal of the Picture Tube should be determined according to Fig. 34 when the Tube is mounted.



(Fig. 32)



(Fig. 33)



(Fig. 34)

Trouble Shooting

by Replacement of the Defective Block

Provisions have been made in this TV for easy servicing. The main part of the set is made of four Blocks of the Tuner, the Signal Circuit Board, the Deflection Circuit Board and the High Voltage Block. Each of these Blocks has complete interchangeability and hence the servicing can be performed by simply replacing the defective Block with a new one.

The way of judging which block is defective and the method of replacing the Block will be given below.

Replacement Blocks :

Tuner, Signal Circuit Board, Deflection Circuit Board and High Voltage Block

Tools and Meters :

Multi-meter of internal resistance around 20 KΩ/V
Cord with Clips.....2 pcs.
Electrolytic Condenser, 3 μF, 500 V or more.....1 piece
Resistor, around 15 KΩ.....1 piece
Screw Drivers
For 3 mm Screws, Philips and ordinary
For 2.6 mm Screws, Philips and ordinary
No. 3 for watches for adjustment of local oscillator
Tweezers
Soldering Iron

Raster

1. No Raster and No Sound

   Suspectable Item : * Power Supply

   Check the Power Supply. If there is no trouble in the Power Supply, there must be two or more Blocks defective. Then proceed with the checking according to the following.

2. No Raster

   See first whether the Neon Lamp is lit.

   1) The Neon Lamp is OFF.

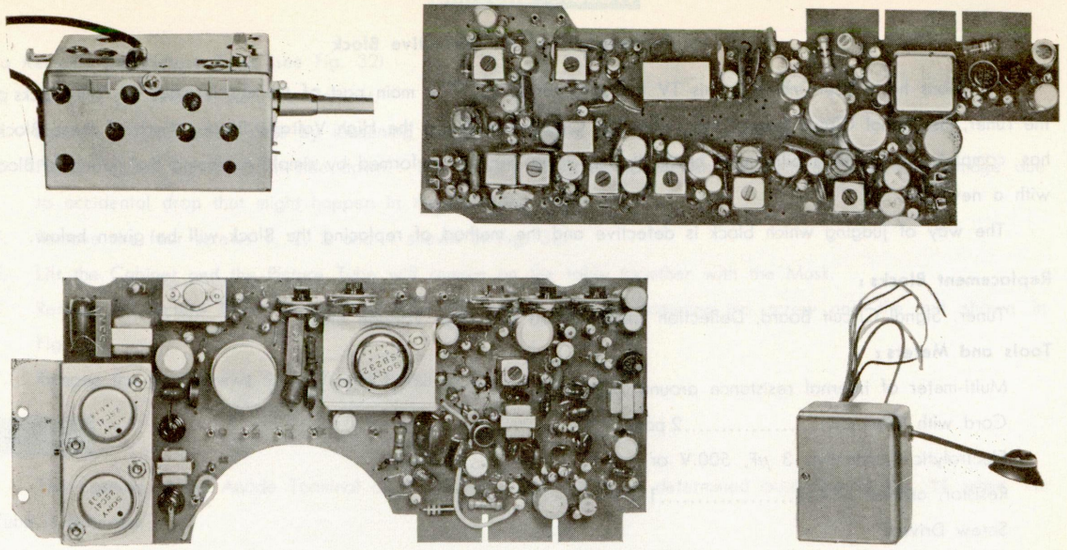
      Suspectable Items : * Deflection Circuit Board
      * High Voltage Block

      a) Replace the Deflection Circuit Board.
      b) If the Neon Lamp is not lit after a), replace the High Voltage Block.

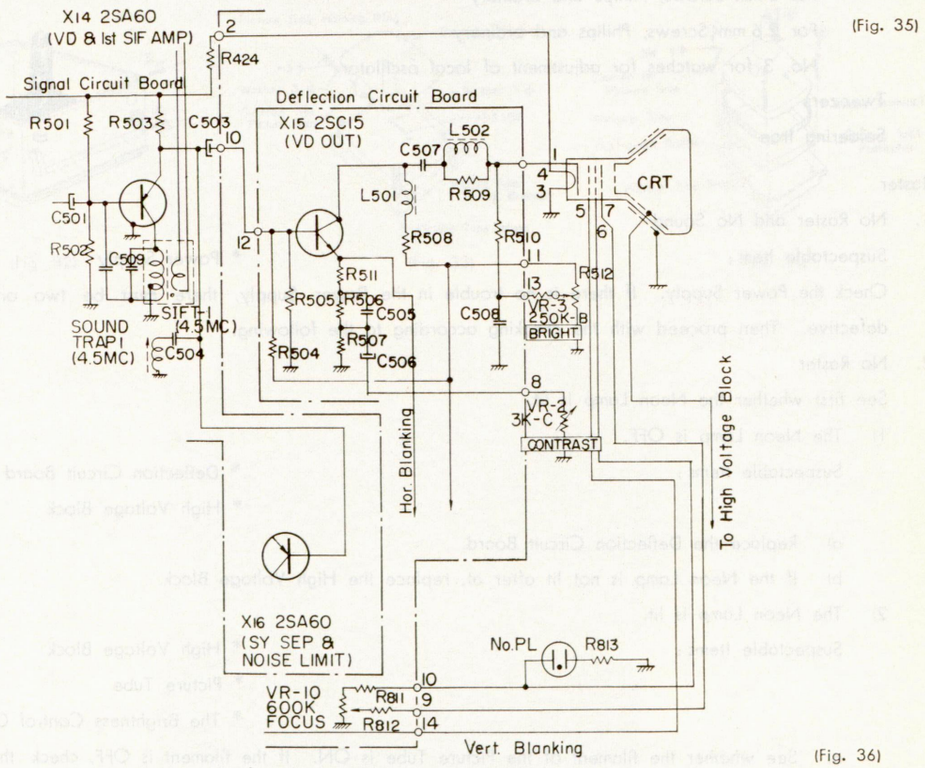
   2) The Neon Lamp is lit.

      Suspectable Items : * High Voltage Block
      * Picture Tube
      * The Brightness Control Circuit

      a) See whether the filament of the Picture Tube is ON. If the filament is OFF, check the Socket for the Picture Tube. The pins for the filament are Nos. 3 and 4.
      b) If the filament is ON, the trouble is probably with the High Voltage Block. Before proceeding on to replace the High Voltage Block, see whether the cathode circuit of the Picture Tube (the Brightness Control Circuit) is all right.



(Fig. 35)



(Fig. 36)

To do this, measure the cathode voltage (pin Y on the Deflection Board) from the coppor side of the Deflection Circuit Board (refer to Fig. 36). If this voltage is varied between 0 and 15 to 75 Volts by an adjustment of the Brightness Control, the cathode circuit is all right, and the High Voltage Block is to be replaced.

c) If the voltage is abnormal, the Brightness Control Circuit on the Deflection Circuit Board must be checked.

d) If the Raster still does not appear after replacing the High Voltage Block, the Picture Tube may be defective.

CAUTION :

NEVER ATTEMPT TO CHECK THE HIGH VOLTAGE (8 KV) CIRCUIT BY SPARK TEST

The High Voltage is often tested by a Spark Test. But, in Transistor TV, this is likely to cause damage not only to the Horizontal Deflection Circuit but also to others seemingly not related parts of the set. Especially, the High Voltage Spark will adversely affect the transistors on the Signal Circuit Board because of the Pulse AGC Circuit employed.

3. Raster appears but is abnormal .

First of all check the 12 V DC Supply.

1) Too small Raster

Suspectable Item : * Deflection Circuit Board

Replace the Deflection Circuit Board

2) Raster is dark.

Suspectable Items : * Picture Tube * High Voltage Block

a) When the Raster Size is normal but is not bright enough, the trouble is almost certainly with the Picture Tube.

b) When the Raster spreads out and gets dark while the Brightness is meant to be increased, the trouble is with the reduced emission of the High Voltage Rectifier Tube and the High Voltage Block must be replaced.

Video Output and Synchronization

1. No Picture (Sound is normal)

Suspectable Items : * Deflection Circuit Board * Signal Circuit Board

Check the Video Output Circuit as follows :

Apply AC test voltage taken from the secondary winding of the transformer through a 15 KΩ resistor and a 3μF, 500 WV or more Electrolytic Condenser, to the Terminal No. 12 (the Input terminal to the Video Output Circuit) of the Deflection Circuit Board as shown in Fig. 36. If the AC hum appears on the Picture Tube, replace the Signal Circuit Board. If not, replace the Deflection Circuit Board.

2. Failure of Synchronization

1) Failure of both Horizontal and Vertical Synchronization.

Suspectable Items : * Deflection Circuit Board * Signal Circuit Board

Measure the voltage at Terminal No. 11 of the Signal Circuit Board and decide whether the trouble is with the Signal Circuit Board or with the Deflection Circuit Board. The normal value of the voltage is around 2.5 V.

If the voltage is more than 2.5 V, replace the Signal Circuit Board. If it is abnormally low, replace the Deflection Circuit Board.

2) Failure of either Horizontal or Vertical Synchronization alone.

Suspectable Items : * Deflection Circuit Board

In this case, replace the Deflection Circuit Board.

3. No Picture and No sound

Suspectable Items : * Tuner * Signal Circuit Board

1) Replace the Signal Circuit Board and see the result.

2) Apply the output from another tuner to the Input Terminal of the Signal Circuit Board as shown in Fig. 37 and see the result. The Power to this tuner is to be taken from the set with a length of cord with clips.

4. Only one or few Channels are defective

Suspectable Items : * Tuner * Signal Circuit Board * Deflection Circuit Board

For troubles like low contrast, poor signal to noise ratio and poor resolution, replace the Signal Circuit Board first. Then, if the signal to noise ratio is still poor, replace the Tuner. If the contrast is low, replace the Deflection Circuit Board.

Sound (Picture is normal)

1. No Sound

   Suspectable Items : * Speaker * Signal Circuit Board

   Listen with the earphone.

   1) Check the Speaker and the Earphone Jack if sound is heard through the earphone.

   2) If still no sound can be heard, replace the Signal Circuit Board.

2. Sound is distorted.

   Suspectable Items : * Speaker * Signal Circuit Board

   Judge by hearing the sound whether the trouble is with the defective Speaker. If the trouble is not caused by the Speaker, replace the Signal Circuit Board.

3. Buzzing

   Suspectable Items : * Antenna * Fine Tuning * SIFT 3 * Signal Circuit Board

   1) If the Buzz appears only on some specific channel, the trouble is not with the set itself. Adjust the Antenna and the Fine Tuning.

   2) If the Buzz appears on all channels, adjust the blue core of SIFT 3.

   3) Then, if the Buzz still exists, replace the Signal Circuit Board.

4. Other troubles with Sound

   Suspectable Item : * Signal Circuit Board

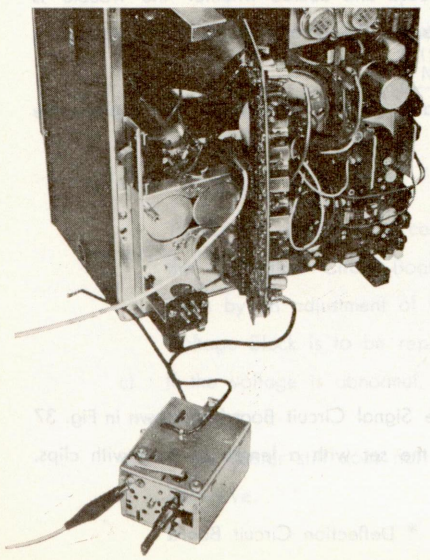
   For other troubles with the Sound, replace the Signal Circuit Board.

Adjustment of the Local Oscillator Frequency

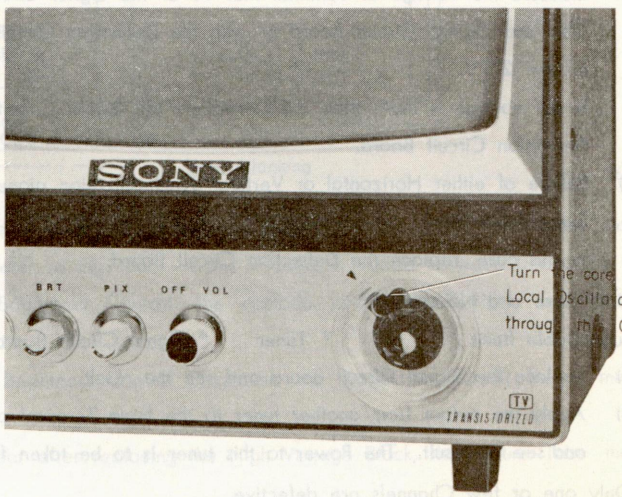
The Local Oscillator Frequency can be adjusted without disassembling the Tuner. To do this, pull out the Channel Selector Knob and turn the Fine Tuning Knob to match the center of the opening on it to that of the small hole on the Control Panel.

Turn the core of the Oscillator Coil in the Tuner through the opening with a screw driver.

The Frequency increases as the core is turned clockwise.



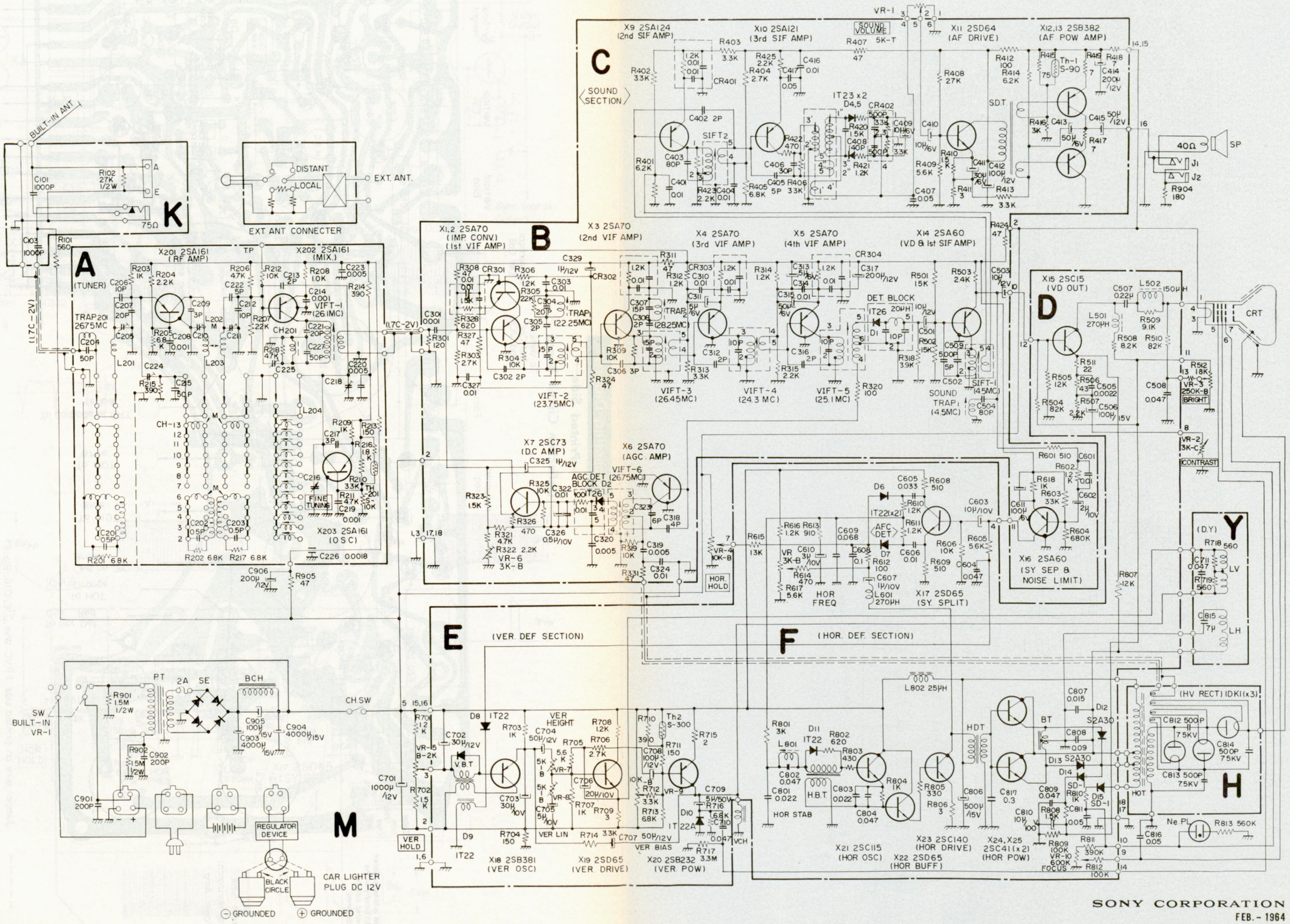
(Fig. 37)



Turn the core of the Local Oscillator Coil through this Opening.

(Fig. 38)

Schematic Diagram



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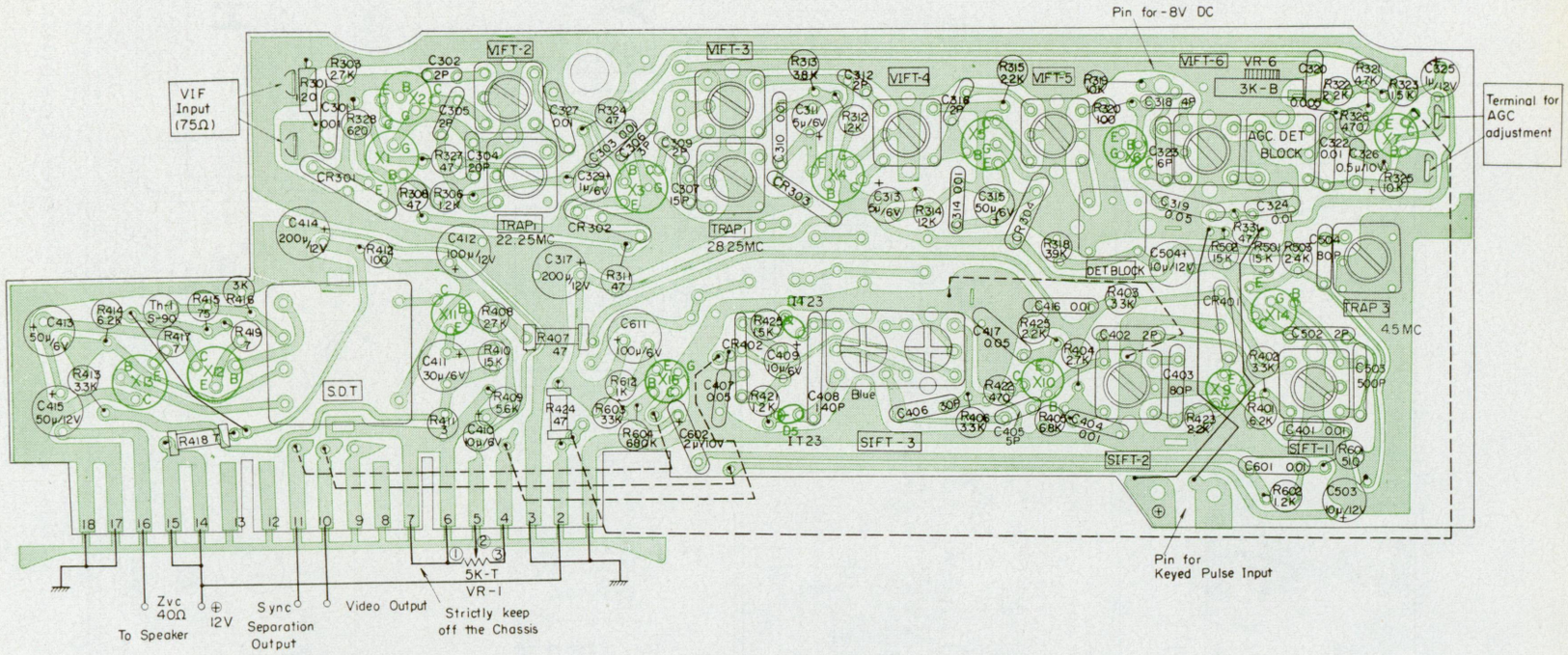
FEB.- 1964

Mounting Diagram

—Printed Side—

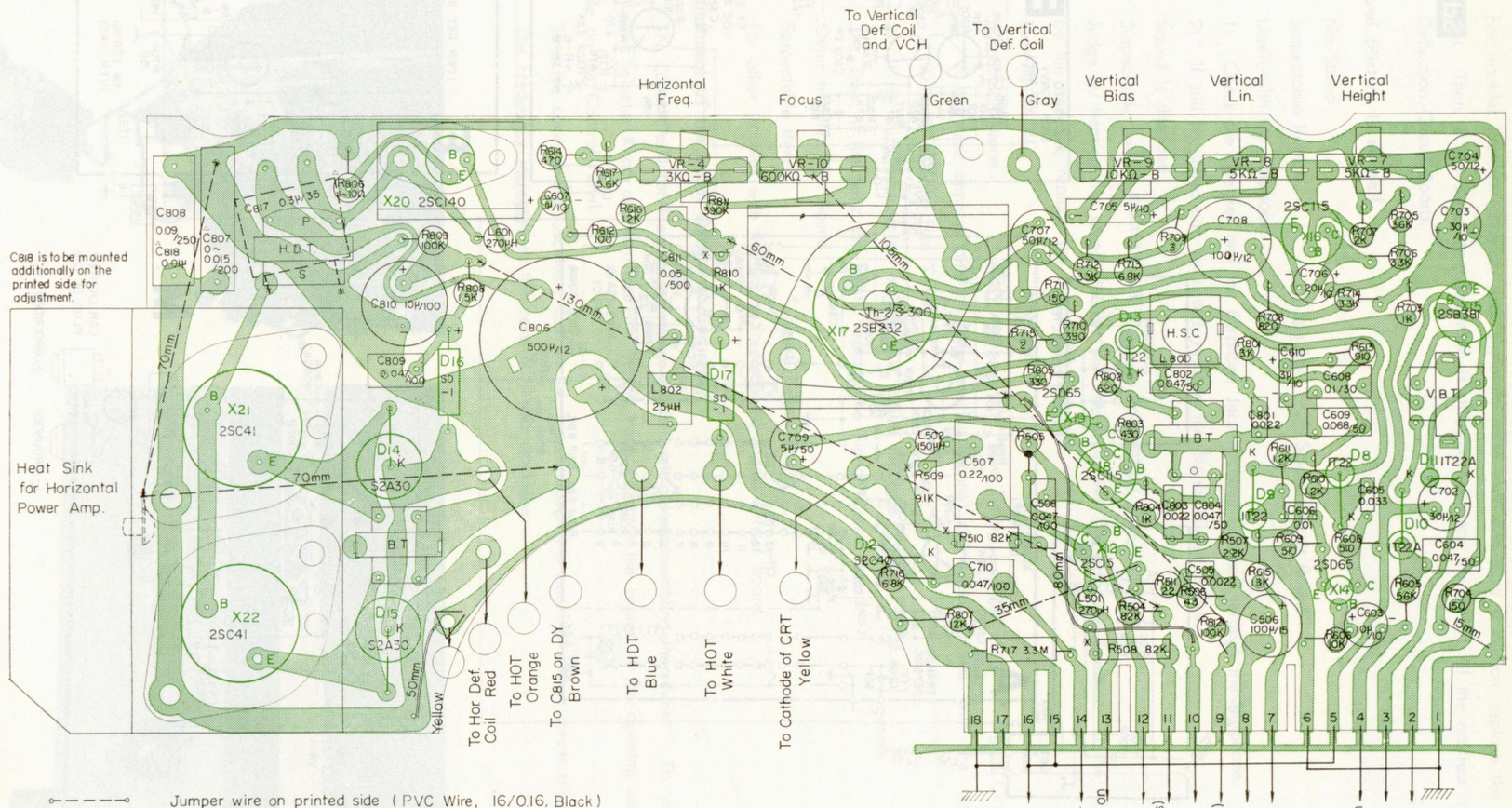
Signal Circuit Board



Mounting Diagram

—Printed Side—

—Deflection Circuit Board—



Jumper wire on printed side (PVC Wire, 16/0.16, Black)

Jumper wire on Mounted side (Tinned Copper Wire, 1/0.6)

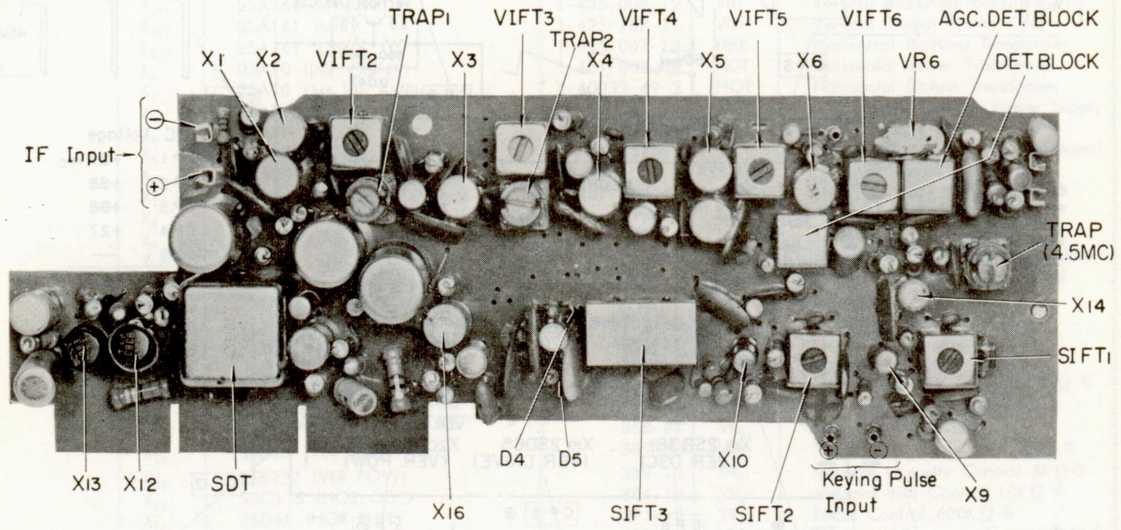
Jumper wire on Mounted side (PVC Wire, 1/0.64, Yellow)

Note. 1. Resistors designated X show 1/4L type.

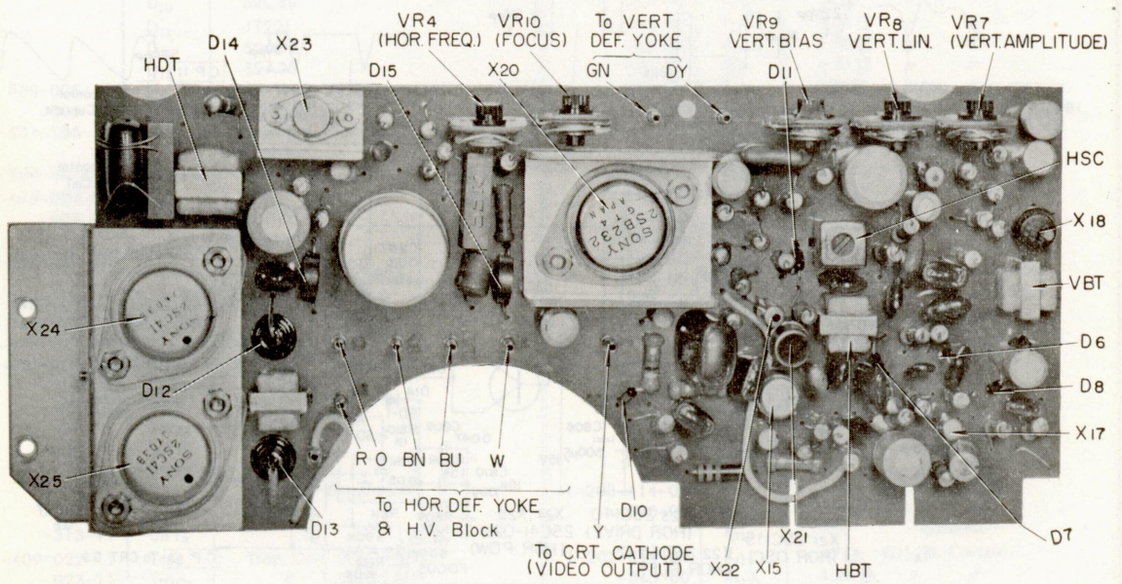
2. Resistor below 10Ω are of wire-wound type.

3. Resistors and Capacitors designated Δ are to be adjusted.

Signal Circuit Board

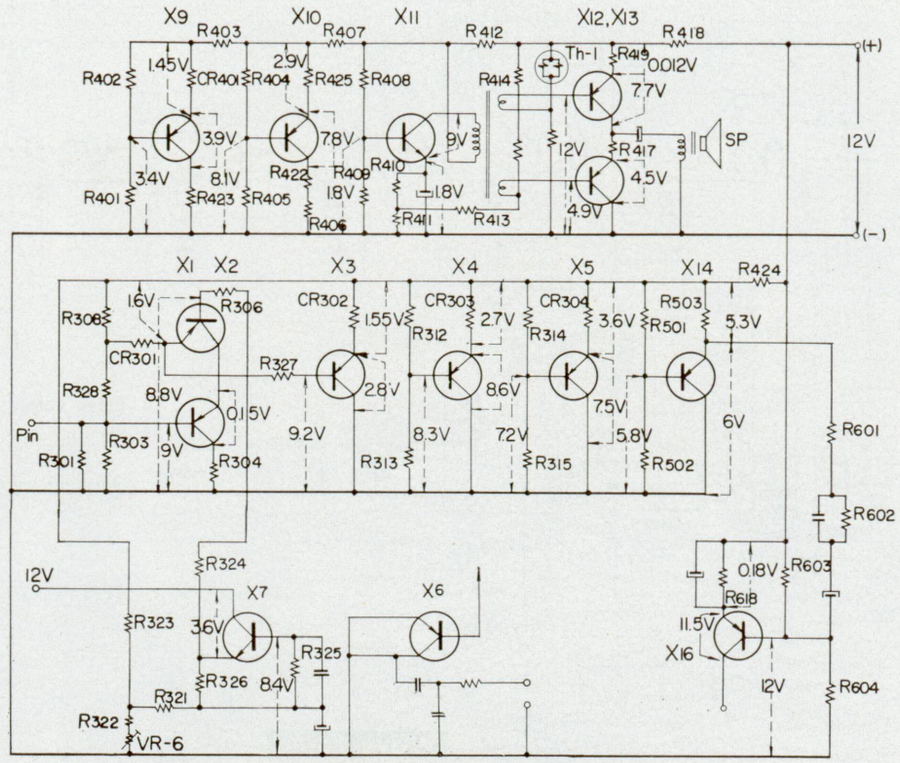


Deflection Circuit Board



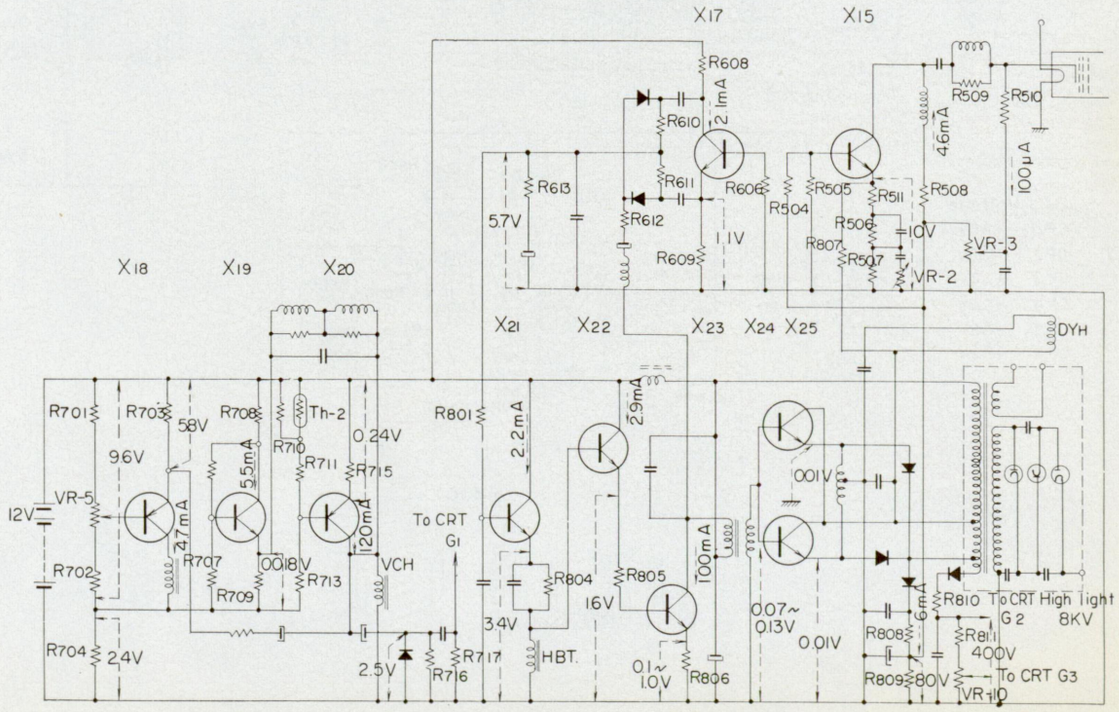
Voltage Distribution Chart

—Signal Circuit Board—



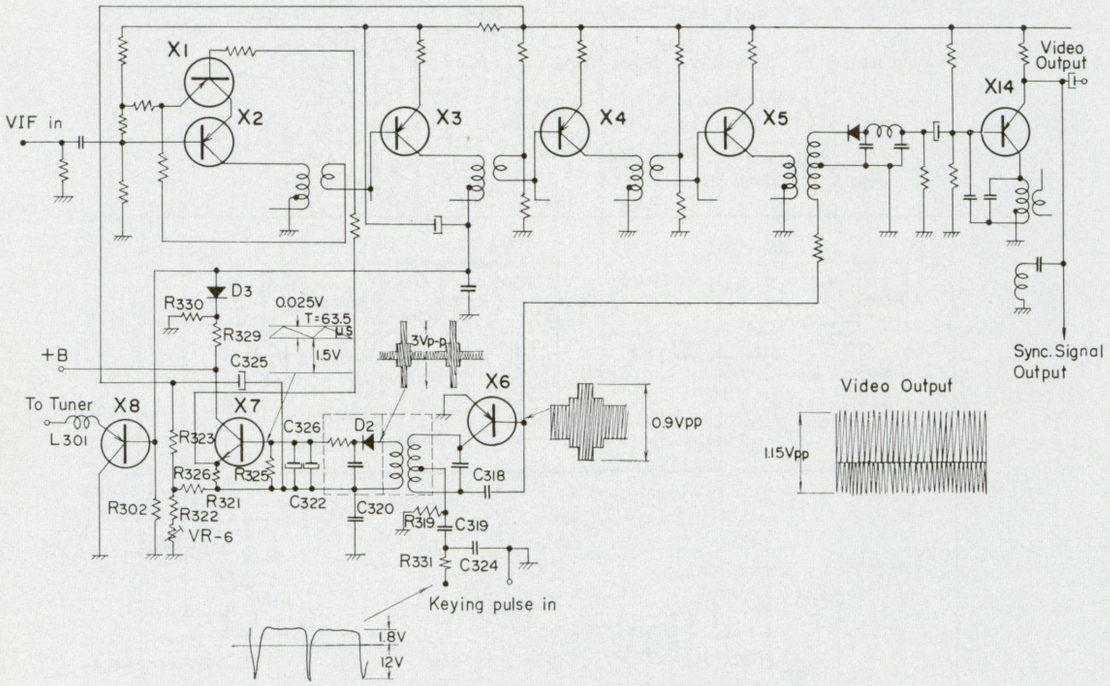
Voltage and Current Distribution Chart

—Deflection Circuit Board—



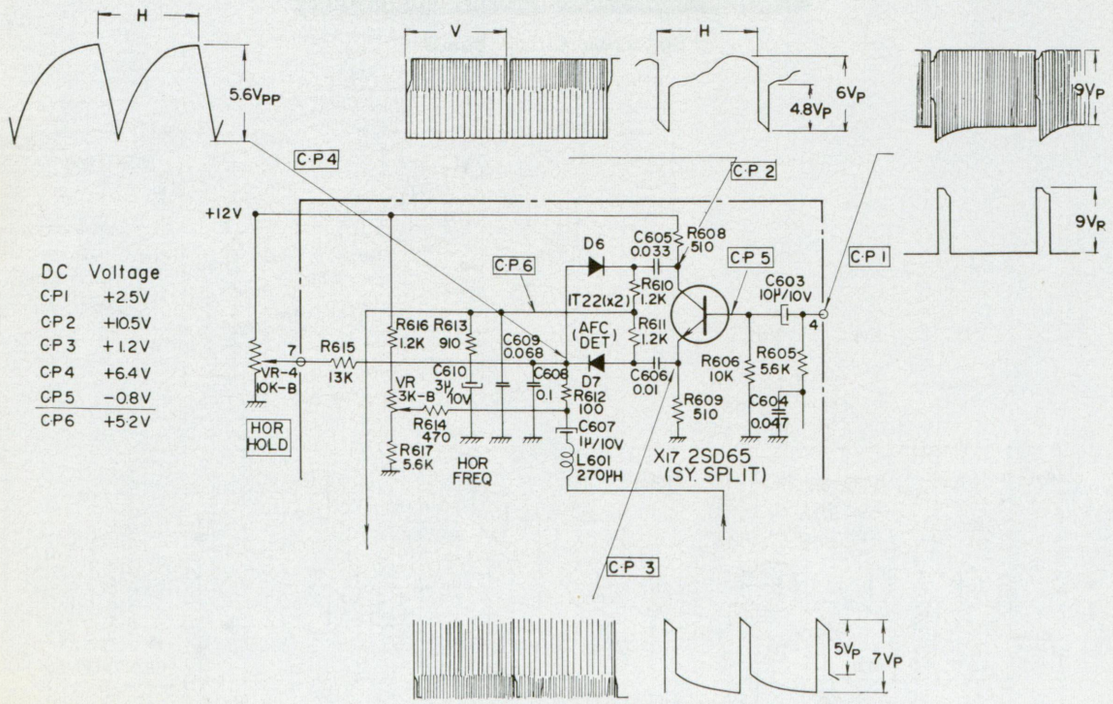
Wave Forms

—Pulse AGC Circuit—



Wave Forms

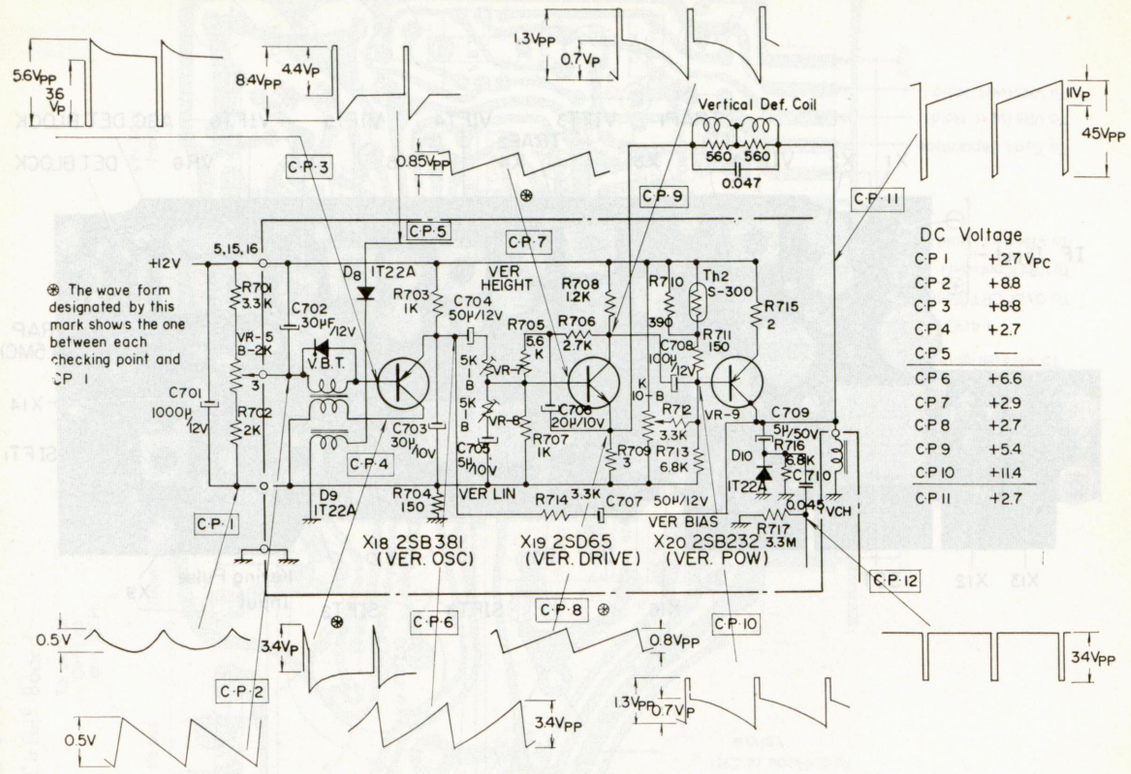
—AFC AMP.—



DC	Voltage
CP1	+2.5V
CP2	+10.5V
CP3	+1.2V
CP4	+6.4V
CP5	−0.8V
CP6	+5.2V

Wave Forms

—Ver. Def. Circuit—



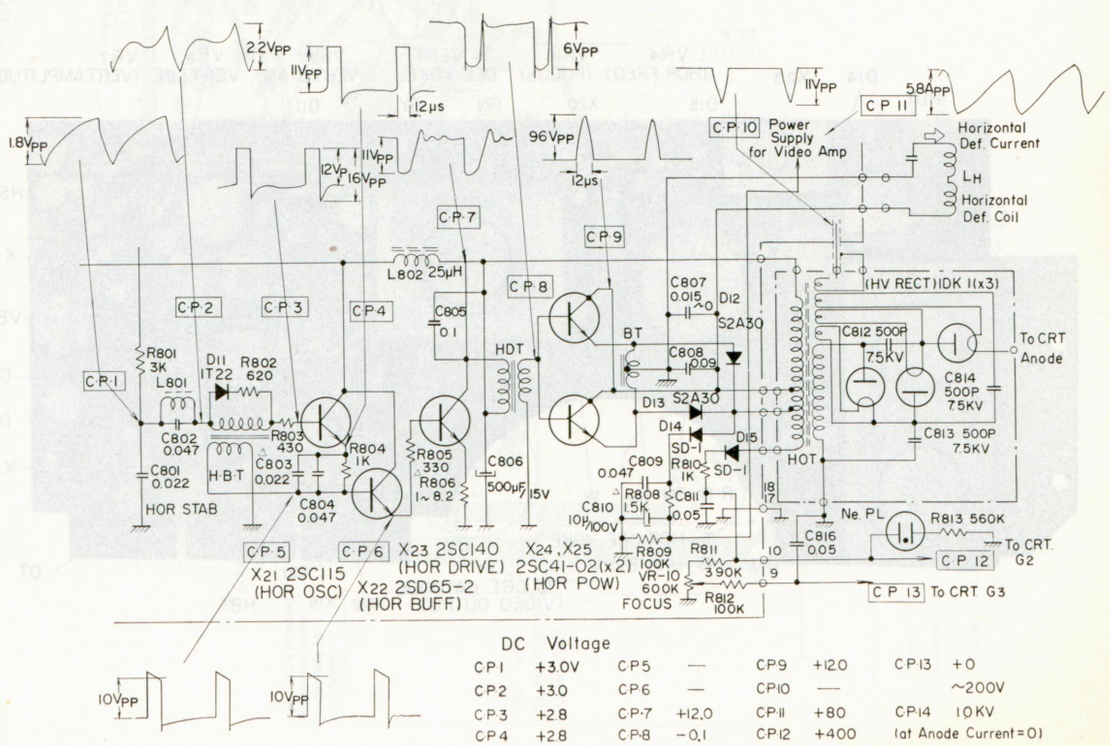
⊛ The wave form designated by this mark shows the one between each checking point and C·P 1

DC Voltage

C·P 1	+2.7 Vpc
C·P 2	+8.8
C·P 3	+8.8
C·P 4	+2.7
C·P 5	—
C·P 6	+6.6
C·P 7	+2.9
C·P 8	+2.7
C·P 9	+5.4
C·P 10	+11.4
C·P 11	+2.7

Wave Forms

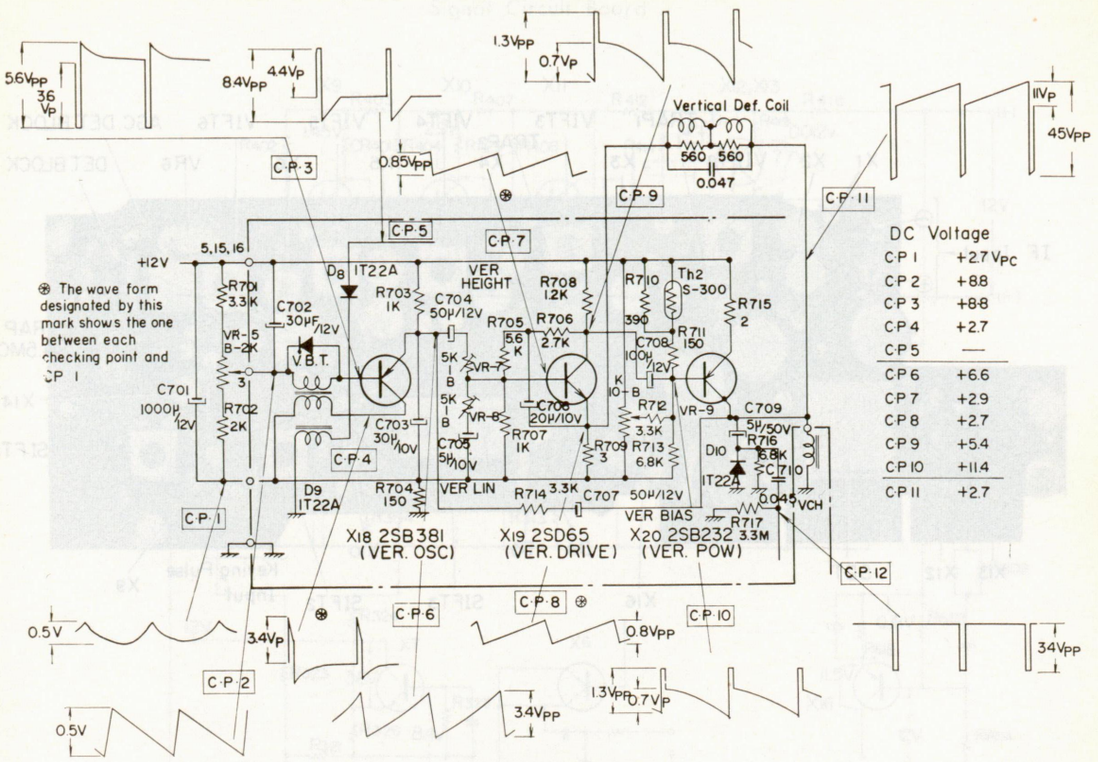
—Hor. Def. Circuit—



DC	Voltage						
CP1	+3.0V	CP5	—	CP9	+120	CP13	+0
CP2	+3.0	CP6	—	CP10	—		~200V
CP3	+2.8	CP7	+12.0	CP11	+80	CP14	10KV
CP4	+2.8	CP8	−0.1	CP12	+400	(at Anode Current=0)	

Wave Forms

—Ver. Def. Circuit—



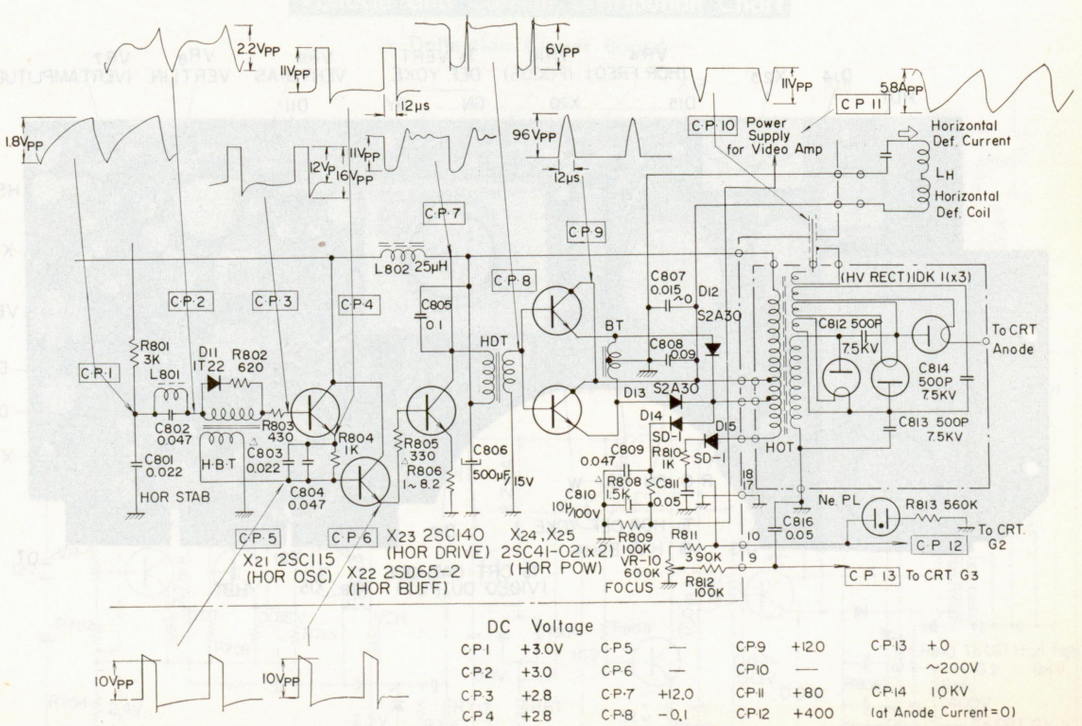
✱ The wave form designated by this mark shows the one between each checking point and C·P·1

DC Voltage

C·P·1	+2.7 V_{DC}
C·P·2	+8.8
C·P·3	+8.8
C·P·4	+2.7
C·P·5	—
C·P·6	+6.6
C·P·7	+2.9
C·P·8	+2.7
C·P·9	+5.4
C·P·10	+11.4
C·P·11	+2.7

Wave Forms

—Hor. Def. Circuit—



DC Voltage

C·P·1	+3.0V	C·P·5	—	C·P·9	+120	C·P·13	+0
C·P·2	+3.0	C·P·6	—	C·P·10	—		~200V
C·P·3	+2.8	C·P·7	+12.0	C·P·11	+80	C·P·14	10KV
C·P·4	+2.8	C·P·8	−0.1	C·P·12	+400	(at Anode Current=0)	

Electrical Parts List (A)

Part No.	Symbol	Description	Part No.	Symbol	Description
		Transistor	1-423-067-11	SDT	Sound Driver Transformer
	X_{201}	2SA161 (RF AMP)	1-435-008-12	VBT	Vertical Blocking Transformer
	X_{202}	2SA161 (MIX)	1-421-107-11	VCH	Vertical Output Choke Coil
	X_{203}	2SA161 (OSC)	1-435-007-13	HBT	Horizontal Blocking Transformer
	X_1	2SA70 (IMP CONV)	1-437-002-00	HDT	Horizontal Driver Transformer
	X_2	2SA70 (1st VIF AMP)	X-40032-69-2	HOT	Horizontal Output Transformer
	X_3	2SA70 (2nd VIF AMP)	1-421-014-11	BCH	Filter Choke Coil for Power Supply
	X_4	2SA70 (3rd VIF AMP)	1-441-085-11	PT	Power Transformer
	X_5	2SA70 (4th VIF AMP)	1-437-051-11	BT	Balance Transformer for Horizontal Power Transistor
	X_6	2SA70 (AGC AMP)			Micro Inductor (270µH)
	X_7	2SC73 (DC AMP)	1-407-049-11	L_{501}	
	X_8	—deleted—	-030-11	L_{502}	〃 (150µH)
	X_9	2SA124 (2nd SIF AMP)	-049-11	L_{601}	〃 (270µH)
	X_{10}	2SA121 (3rd SIF AMP)	1-413-005-11	L_{801}	Stabilizing Coil for Horizontal Sweep
	X_{11}	2SD64 (AF DRIVE)	1-421-013-11	L_{802}	Horizontal Chock Coil (25µH)
	X_{12}	2SB382 (AF POW AMP)			**Potentiometer**
	X_{13}	2SB382 (AF POW AMP)	1-221-388-12	VR_1	Volume Control 5KΩ-T
	X_{14}	2SA60 (VD & 1st SIF AMP)	-386-11	VR_2	Contrast Control 3KΩ-C
	X_{15}	2SC15 (VD OUT)	-384-11	VR_3	Brightness Control 250KΩ-B
	X_{16}	2SA60 (SYNC SEP & NOISE LIMIT)	-385-11	VR_4	Horizontal Hold Control 10KΩ-B
	X_{17}	2SD65 (SYNC SPLIT)	-387-11	VR_5	Vertical Hold Control 2KΩ-B
	X_{18}	2SB381 (VER OSC)	-355-11	VR_6	AGC Setting 3KΩ-B
	X_{19}	2SD65 (VER DRIVE)	-389-12	VR_7	Vertical Height Control 5KΩ-B
	X_{20}	2SB232 (VER POW)	-389-12	VR_8	Vertical Linearity Control 5KΩ-B
	X_{21}	2SC115 (HOR OSC)	-304-12	VR_9	Vertical Bias Control 10KΩ-B
	X_{22}	2SD65 (HOR BUFF)	-391-12	VR_{10}	Focus Control 600KΩ-B
	X_{23}	2SC140 (HOR DRIVE)	-390-12	VR_{11}	Horizontal Frequency Control 3KΩ-B
	X_{24}	2SC41 (HOR POW)			**Encapsulated Component**
	X_{25}	2SC41 (HOR POW)	1-101-537-11	CR_{301}	1.5KΩ, 0.01µF, 0.01µF
		Diode	-406-01	CR_{302}	1.2KΩ, 0.01µF, 0.01µF
	D_1	1T261J (built in VD DET BLOCK)	-406-01	CR_{303}	〃
	D_2	1T261J (built in AGC DET BLOCK)	-406-01	CR_{304}	〃
	D_3	—deleted—	-406-01	CR_{401}	〃
	D_4	1T23G	-536-11	CR_{402}	3.3KΩ×2, 500PF×2
	D_5	1T23G			**Resistor**
	D_6	1T22J	1-203-027-11	R_{101}	560Ω RD¼L Carbon
	D_7	1T22J	1-204-015-11	R_{102}	56KΩ RD1/16L 〃
	D_8	1T22A	1-203-187-00	R_{201}	6.8KΩ 〃 〃
	D_9	1T22A	-187-00	R_{202}	6.8KΩ 〃 〃
	D_{10}	S2C40	-182-00	R_{203}	1KΩ 〃 〃
	D_{11}	1T22J	-184-00	R_{204}	2.2KΩ 〃 〃
	D_{12}	S2A30	-188-00	R_{205}	7.5KΩ 〃 〃
	D_{13}	S2A30	-185-00	R_{206}	4.7KΩ 〃 〃
1-800-005-11	D_{14}	SD-1LA	-891-11	R_{207}	22KΩ 〃 〃
-005-11	D_{15}	SD-1LA	-182-00	R_{208}	1KΩ 〃 〃
1-531-105-11	SE	Selenium Rectifier	-421-00	R_{209}	1KΩ RD1/16RL 〃
		Thermistor	-434-00	R_{210}	3.3KΩ 〃 〃
1-800-001-00	Th_{201}	S-10K	-185-00	R_{211}	4.7KΩ RD1/16L 〃
8-690-003-00	Th_1	S-90	-190-00	R_{212}	10KΩ 〃 〃
-005-00	Th_2	S-300	-856-00	R_{213}	150Ω 〃 〃
		HV Rectifier	-181-00	R_{214}	390Ω 〃 〃
1-525-039-00		1DK1	-181-00	R_{215}	390Ω 〃 〃
		Coil and Transformers	-434-00	R_{216}	3.3KΩ RD1/16RL 〃
X-44012-54-0	$L_{201\sim204}$	Tuner Rotary Coil	-187-00	R_{217}	6.8KΩ RD1/16L 〃
1-409-029-11	$Trap_{201}$	Video IF Trap Coil	-185-00	R_{218}	4.7KΩ 〃 〃
1-407-022-11	CH_{201}	IF Choke Coil	-875-00	R_{301}	120Ω 〃 〃
1-403-401-01	$VIFT_1$	Video IF Transformer	-388-00	R_{302}	27KΩ RD⅛RL 〃
-427-11	$VIFT_2$	〃	-372-00	R_{303}	2.7KΩ 〃 〃
-428-11	$VIFT_3$	〃	-190-00	R_{304}	10KΩ RD1/16L 〃
-429-11	$VIFT_4$	〃	-891-00	R_{305}	22KΩ 〃 〃
-430-11	$VIFT_5$	〃	-368-00	R_{306}	1.2KΩ RD⅛RL 〃
-419-00	$VIFT_6$	〃		R_{307}	—deleted—
-314-11	$SIFT_1$	Sound IF Transformer	1-203-414-00	R_{308}	47Ω RD⅛RL Carbon
-315-11	$SIFT_2$	〃	-190-00	R_{309}	10KΩ RD1/16L 〃
-313-11	$SIFT_3$	〃		R_{310}	—deleted—
1-409-022-11	$Trap_1$	Trap Coil (22.25 Mc)	1-203-414-00	R_{311}	47Ω RD⅛RL Carbon
-023-11	$Trap_2$	〃 (28.25 Mc)	-368-00	R_{312}	1.2KΩ 〃 〃
-024-11	SOUND $Trap_1$	Sound Signal Trap Coil	-373-00	R_{313}	3.3KΩ 〃 〃
			-368-00	R_{314}	1.2KΩ 〃 〃
1-403-420-02	DET BLOCK	Video Detector Block	-370-00	R_{315}	2.2KΩ 〃 〃
				R_{316}	—deleted—
-431-11	AGC DET BLOCK	AGC Detector Block		R_{317}	〃
			1-203-878-00	R_{318}	3.9KΩ RD1/16RL Carbon

Part No.	Symbol	Description
1-203-383-00	R_{319}	10KΩ RD1/8RL Carbon
-357-00	R_{320}	100Ω 〃 〃
-376-00	R_{321}	4.7KΩ 〃 〃
-370-00	R_{322}	2.2KΩ 〃 〃
-405-00	R_{323}	1.5KΩ 〃 〃
-414-00	R_{324}	47Ω 〃 〃
-383-00	R_{325}	10KΩ 〃 〃
-361-00	R_{326}	470Ω 〃 〃
-414-00	R_{327}	47Ω 〃 〃
-857-00	R_{328}	620Ω 〃 〃
	R_{329}	—deleted—
	R_{330}	〃
1-203-414-00	R_{331}	47Ω RD1/8RL Carbon
-380-00	R_{401}	6.2KΩ 〃 〃
-373-00	R_{402}	3.3KΩ 〃 〃
-373-00	R_{403}	3.3KΩ 〃 〃
-372-00	R_{404}	2.7KΩ 〃 〃
-381-00	R_{405}	6.8KΩ 〃 〃
-634-00	R_{406}	33KΩ RD1/16RL 〃
-148-00	R_{407}	47Ω RD1/4L 〃
-388-00	R_{408}	27KΩ RD1/8RL 〃
-378-00	R_{409}	5.6KΩ 〃 〃
-405-00	R_{410}	1.5KΩ 〃 〃
-704-00	R_{411}	3Ω 〃 〃
-357-00	R_{412}	100Ω 〃 〃
-373-00	R_{413}	3.3KΩ 〃 〃
-380-00	R_{414}	6.2KΩ 〃 〃
-356-00	R_{415}	75Ω 〃 〃
-443-00	R_{416}	3KΩ 〃 〃
-461-11	R_{417}	7Ω 〃 〃
-462-11	R_{418}	7Ω RD1/4L 〃
-461-11	R_{419}	7Ω RD1/8RL 〃
-422-00	R_{420}	1.5KΩ RD1/16RL 〃
-780-00	R_{421}	1.2KΩ 〃 〃
-361-00	R_{422}	470Ω RD1/8RL 〃
-423-00	R_{423}	2.2KΩ RD1/16RL 〃
-148-00	R_{424}	47Ω RD1/4L 〃
-370-00	R_{425}	2.2KΩ RD1/8RL 〃
-386-00	R_{501}	15KΩ 〃 〃
-386-00	R_{502}	15KΩ 〃 〃
-778-00	R_{503}	2.4KΩ 〃 〃
-397-00	R_{504}	82KΩ 〃 〃
-384-00	R_{505}	12KΩ 〃 〃
-820-00	R_{506}	43Ω 〃 〃
-370-00	R_{507}	2.2KΩ 〃 〃
-068-00	R_{508}	8.2KΩ RD1/4L 〃
-802-00	R_{509}	9.1KΩ RD1/8RL 〃
-123-00	R_{510}	120KΩ RD1/4L 〃
-352-00	R_{511}	22Ω RD1/8RL 〃
-097-00	R_{512}	56KΩ RD1/4L 〃
-316-00	R_{601}	510Ω RD1/8RL 〃
-368-00	R_{602}	1.2KΩ 〃 〃
-390-00	R_{603}	33KΩ 〃 〃
-326-00	R_{604}	680KΩ 〃 〃
-378-00	R_{605}	5.6KΩ 〃 〃
-383-00	R_{606}	10KΩ 〃 〃
	R_{607}	—deleted—
1-203-316-00	R_{608}	510Ω RD1/8RL Carbon
-316-00	R_{609}	510Ω 〃 〃
-368-00	R_{610}	1.2KΩ 〃 〃
-368-00	R_{611}	1.2KΩ 〃 〃
-357-00	R_{612}	100Ω 〃 〃
-761-00	R_{613}	910Ω 〃 〃
-361-00	R_{614}	470Ω 〃 〃
-444-00	R_{615}	13KΩ 〃 〃
-368-00	R_{616}	1.2KΩ 〃 〃
-378-00	R_{617}	5.6KΩ 〃 〃
-367-00	R_{618}	1KΩ 〃 〃
-037-00	R_{701}	1.2KΩ RD1/4L 〃
-039-00	R_{702}	1.5KΩ 〃 〃
-367-00	R_{703}	1KΩ RD1/8RL 〃
-415-00	R_{704}	150Ω 〃 〃
-378-00	R_{705}	5.6KΩ 〃 〃
-372-00	R_{706}	2.7KΩ 〃 〃
-367-00	R_{707}	1KΩ 〃 〃

Part No.	Symbol	Description
1-203-368-00	R_{708}	1.2KΩ RD1/8RL Carbon
1-207-018-00	R_{709}	3Ω RW1/4RL Wire Wound
1-203-412-00	R_{710}	390Ω RD1/8RL Carbon
-415-00	R_{711}	150Ω 〃 〃
-373-00	R_{712}	3.3KΩ 〃 〃
-381-00	R_{713}	6.8KΩ 〃 〃
-373-00	R_{714}	3.3KΩ 〃 〃
1-207-014-00	R_{715}	2Ω RW1/4RL Wire Wound
1-203-381-00	R_{716}	6.8KΩ RD1/8RL Carbon
1-201-596-00	R_{717}	3.3MΩ RC1/2L Composition
1-203-363-00	R_{718}	560Ω RD1/8RL Carbon
-363-00	R_{719}	560Ω 〃 〃
-443-00	R_{801}	3KΩ 〃 〃
-857-00	R_{802}	620Ω 〃 〃
-760-00	R_{803}	430Ω 〃 〃
-367-00	R_{804}	1KΩ 〃 〃
-360-00	R_{805}	330Ω 〃 〃
1-207-018-00	R_{806}	3Ω RW1/4RL Wire Wound
1-203-384-00	R_{807}	12KΩ RD1/8RL Carbon
-405-00	R_{808}	1.5KΩ 〃 〃
-399-00	R_{809}	100KΩ 〃 〃
-031-00	R_{810}	1KΩ RD1/4L 〃
-867-00	R_{811}	390KΩ RD1/8RL 〃
-399-00	R_{812}	100KΩ 〃 〃
-464-00	R_{813}	560KΩ RD1/4L 〃
1-201-455-00	R_{901}	1.5MΩ RC1/2L Composition
-455-00	R_{902}	1.5MΩ 〃 〃
	R_{903}	—deleted—
1-203-334-00	R_{904}	180Ω RD1/4L Carbon
-148-00	R_{905}	47Ω 〃 〃
		Capacitor
1-101-002-12	C_{101}	2000PF Ceramic
-002-12	C_{102}	2000PF 〃
-076-11	C_{201}	0.5PF 〃
-076-11	C_{202}	0.5PF 〃
-076-11	C_{203}	0.5PF 〃
-041-11	C_{204}	50PF 〃
1-141-055-11	C_{205}	Cylindrical Trimmer Capacitor
1-101-039-11	C_{206}	10PF Ceramic
-040-11	C_{207}	20PF 〃
-042-12	C_{208}	0.001μF 〃
-036-11	C_{209}	3PF 〃
1-141-055-11	C_{210}	Cylindrical Trimmer Capacitor
-055-11	C_{211}	〃
1-101-039-11	C_{212}	10PF Ceramic
-035-11	C_{213}	2PF 〃
-042-12	C_{214}	0.001μF 〃
-041-11	C_{215}	50PF 〃
1-141-054-00	C_{216}	Cylindrical Trimmer Capacitor
1-101-526-11	C_{217}	3.6PF Ceramic
1-141-055-11	C_{218}	Cylindrical Trimmer Capacitor
1-101-042-12	C_{219}	0.001μF Ceramic
-058-12	C_{220}	0.005μF 〃
-040-11	C_{221}	20PF 〃
-038-11	C_{222}	5PF 〃
-058-12	C_{223}	0.005μF 〃
1-141-055-11	C_{224}	Cylindrical Trimmer Capacitor
-055-11	C_{225}	〃
1-101-201-11	C_{226}	0.0018μF Feed Through Capacitor
-041-11	C_{227}	50PF Ceramic
-001-11	C_{301}	0.001μF 〃
-010-11	C_{302}	2PF 〃
-004-11	C_{303}	0.01μF 〃
-111-18	C_{304}	20PF 〃
-010-13	C_{305}	2PF 〃
-011-11	C_{306}	3PF 〃
-114-17	C_{307}	15PF 〃
-010-11	C_{308}	2PF 〃
	C_{309}	—deleted—
1-101-004-11	C_{310}	0.01μF Ceramic
1-121-106-01	C_{311}	5μF 6V Electrolytic
1-101-010-11	C_{312}	2PF Ceramic
1-121-106-01	C_{313}	5μF 6V Electrolytic
1-101-004-11	C_{314}	0.01μF Ceramic
1-121-135-01	C_{315}	50μF 6V Electrolytic

Part No.	Symbol	Description
1-101-010-11	C_{316}	2PF Ceramic
1-121-121-01	C_{317}	200μF 12V Electrolytic
1-101-048-11	C_{318}	4PF Ceramic
-058-01	C_{319}	0.005μF 〃
-058-01	C_{320}	0.005μF 〃
	C_{321}	—deleted—
1-101-004-11	C_{322}	0.01μF Ceramic
1-103-096-11	C_{323}	6PF Styrol
1-101-004-11	C_{324}	0.01μF Ceramic
1-121-116-01	C_{325}	1μF 12V Electrolytic
1-127-909-11	C_{326}	0.5μF 10V 〃 (Alox)
1-101-004-11	C_{327}	0.01μF Ceramic
	C_{328}	—deleted—
1-121-145-01	C_{329}	1μF 6V Electrolytic
1-101-004-11	C_{401}	0.01μF Ceramic
-010-11	C_{402}	2PF 〃
-113-18	C_{403}	80PF 〃
-004-11	C_{404}	0.01μF 〃
-012-11	C_{405}	5PF 〃
-115-17	C_{406}	30PF 〃
-007-11	C_{407}	0.05μF 〃
-740-17	C_{408}	140PF 〃
1-121-104-01	C_{409}	10μF 6V Electrolytic
-104-01	C_{410}	10μF 6V 〃
-102-01	C_{411}	30μF 6V 〃
-120-01	C_{412}	100μF 12V 〃
-135-01	C_{413}	50μF 6V 〃
-121-01	C_{414}	200μF 12V 〃
-122-01	C_{415}	50μF 12V 〃
-118-01	C_{501}	10μF 12V 〃
1-101-012-11	C_{502}	5PF Ceramic
1-121-118-01	C_{503}	10μF 12V Electrolytic
1-101-113-12	C_{504}	80PF Ceramic
1-105-665-12	C_{505}	0.0022μF Mylar
1-121-201-05	C_{506}	100μF 15V Electrolytic
1-105-889-12	C_{507}	0.22μF Mylar
-721-12	C_{508}	0.047μF 〃
1-103-305-11	C_{509}	500PF Styrol
1-101-004-11	C_{601}	0.01μF Ceramic
1-127-913-11	C_{602}	2μF 10V Electrolytic (Alox)
1-121-052-08	C_{603}	10μF 10V 〃
1-105-681-12	C_{604}	0.047μF Mylar

Part No.	Symbol	Description
1-105-669-12	C_{605}	0.033μF Mylar
-673-12	C_{606}	0.01μF 〃
1-127-906-00	C_{607}	1μF 10V Electrolytic (Alox)
1-105-685-12	C_{608}	0.1μF Mylar
-683-12	C_{609}	0.068μF 〃
1-127-908-00	C_{610}	3μF 10V Electrolytic (Alox)
1-121-051-08	C_{611}	100μF 6V 〃
-021-11	C_{701}	1000μF 12V 〃
-119-01	C_{702}	30μF 12V 〃
1-131-008-11	C_{703}	30μF 10V 〃 (Tantalum)
1-121-188-05	C_{704}	50μF 12V 〃
1-127-921-11	C_{705}	5μF 10V 〃 (Alox)
1-121-127-01	C_{706}	20μF 10V 〃
-122-01	C_{707}	50μF 12V 〃
-120-01	C_{708}	100μF 12V 〃
-142-01	C_{709}	5μF 50V 〃
1-105-721-12	C_{710}	0.047μF Mylar
-221-11	C_{711}	0.047μF 〃
-677-12	C_{801}	0.022μF 〃
-681-12	C_{802}	0.047μF 〃
-677-12	C_{803}	0.022μF 〃
-681-12	C_{804}	0.047μF 〃
	C_{805}	—deleted—
1-121-197-01	C_{806}	500μF 15V Electrolytic
1-105-274-11	C_{807}	0.01μF+0.005μF Mylar (Block type)
-273-11	C_{808}	0.09μF 〃
-721-12	C_{809}	0.047μF 〃
1-121-126-01	C_{810}	10μF 100V Electrolytic
1-113-122-11	C_{811}	0.05μF PS
1-101-539-11	C_{812}	500PF Ceramic
-539-11	C_{813}	500PF 〃
-539-11	C_{814}	500PF 〃
1-105-278-12	C_{815}	7μF Mylar
1-113-122-11	C_{816}	0.05μF PS
1-105-097-00	C_{817}	0.3μF Mylar
-167-11	C_{818}	0.01μF 〃
1-109-010-11	C_{901}	200PF Mica
-010-11	C_{902}	200PF 〃
1-119-071-01	C_{903}	4000μF 15V Electrolytic
-071-01	C_{904}	4000μF 15V 〃
-106-11	C_{905}	100μF 15V 〃
-043-05	C_{906}	200μF 12V 〃

Electrical Parts List (B)

Part No.	Description	Q'ty
	A. General	
	Cabinet & Appearance Items	
1-507-030-10	Earphone Jack	1
1-514-107-11	Battery Charger Switch	1
1-502-039-11	Speaker	1
4-003-311-11	Speaker Grommet	4
1-507-110-12	External Antenna Jack Assembly	1
	Main Block	
1-526-052-04	Picture Tube Socket	1
1-545-002-11	Multi-Jack	2
1-532-035-11	Fuse (2A)	1
1-531-105-11	Selenium Rectifier	1
1-536-052-11	Terminal Strip	1
1-533-016-11	Fuse Holder	1
1-519-007-13	Neon Lamp	1
1-536-054-11	Terminal Strip 1-1P	1
1-506-050-11	4P Plug	1
	Accessory	
X-40032-32-1	Accessory Assembly, including	1
1-534-041-20	AC Cord	(1)
-042-21	Extension Cord	(1)
1-504-010-02	Earphone	(1)
X-44017-01-2	External Antenna Connector Assembly, including	1
X-44017-03-1	External Antenna Connector Box	(1)

Part No.	Description	Q'ty
4-401-707-01	Polyethylene Bag for External Antenna Connector	(1)
-709-01	Cushion for External Antenna Connector	(1)
4-495-011-10	Instruction Manual for External Antenna Connector	(1)
	Deflection Yoke	
1-451-005-13	Deflection Yoke Assembly, including	1
1-543-029-11	Deflection Yoke Core DC-29R-1	(1)
4-003-316-01	Yoke Cover	(1)
-317-01	Terminal Plate	(2)
-318-01	Centering Magnet Assembly (A)	(1)
-319-01	〃 〃 〃 (B)	(1)
-320-01	Yoke Core Band (A)	(1)
-321-01	〃 〃 〃 (B)	(1)
-322-01	Terminal Plate Holding Bracket (1)	(1)
-323-01	Spacer for Centering Magnet Assembly	(1)
-324-01	Ring Spring	(1)
-325-01	Capacitor Holding Bracket	(1)
-326-01	Yoke Clamp	(1)
4-003-327-01	Retaining Ring for Deflection Yoke	(1)
7-621-261-62	Screw ⊕ P 3×10	(1)
-32	〃 ⊕ P 3×5	(4)
7-623-616-01	Eyelet 2φ×3	(8)
7-621-259-62	Screw ⊕ P 2.6×10	(1)
1-536-047-11	Connector Tip E	(4)

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Part No.	Description	Q'ty
4-003-328-01	Terminal Plate Holding Bracket (2)	(1)
1-105-721-11	Mylar Capacitor 0.047μF ±20% 100WV C711	(1)
1-203-363-00	Carbon Resistor RD1/8RL 560Ω ±5% R718, 719	(2)
1-105-278-11	Mylar Capacitor (Metallized) 6.5μF ±20% 50WV C815	(1)
	High Voltage Block	
1-453-002-11	High Voltage Block Assembly, including	1
4-003-305-01	High Voltage Block Case	(1)
-306-01	High Voltage Rectifier Tube Mounter	(1)
-307-01	High Voltage Block Shield Case	(1)
-308-01	High Voltage Block Holding Bracket	(1)
-309-01	Core Holding Screw	(2)
X-40032-69-1	Horizontal Output Transformer	(1)
1-525-039-00	High Voltage Rectifier Tube, 1DK1	(3)
1-101-539-11	Ceramic Capacitor 500PF 7.5KV	(3)
1-536-047-11	Connector Tip E	(5)
7-622-105-01	Nut 2φ	(2)
1-526-103-11	Anode Connector	(1)
	Deflection Block	
1-538-137-11	Deflection Circuit Board	1
1-506-108-00	Circuit Connecting Pin A	9
1-507-109-00	Connector Tip	1
	Video & Sound Signal Circuit Board	
1-538-136-12	Video & Sound Signal Circuit Board	1
1-506-108-00	Circuit Connecting Pin A	3
1-507-109-00	Connector Tip	1
	B. Tube	
731270900	Picture Tube CT-468	1
	C. Wires & Miscellaneous	
	(Minimum Q'ty for Ordering : Meter)	
	Cabinet & Appearance Items	
	Co-Axial Cable	
	P. V. C. Wire	

Part No.	Description	Q'ty
	Main Block	
	P. V. C. Wire	
	26/0.16 Brown	
	〃 Black	
	〃 Red	
	16/0.16 Black	
	〃 White	
	〃 Purple	
	〃 Gray	
	〃 Green	
	〃 Orange	
	〃 Brown	
	〃 Yellow	
	〃 Blue	
	Two Conductor Microphone Cord 7/0.12	
	Tinned Copper Wire 0.6φ	
7-611-031-61	**Video & Sound Signal Block**	
	P. V. C. Wire	
	16/0.16 Black	
	Deflection Block	
	P. V. C. Wire	
	16/0.16 Black	
	〃 Yellow	
	Tinned Copper Wire 0.6φ	
	High Voltage Block	
1-904-042-11	Polyethylene Wire 4.2φ	
1-902-490-11	Advance Wire	
	Deflection Yoke	
	P. V. C. Wire	
	26/0.16 Brown	
	〃 Red	
	10/0.16 Green	
	〃 Gray	

Part No.	Description	Q'ty
Y-44012-58-1	Tuner Block BT-13W	1
X-40032-71-1	Video & Sound Signal Block	1
-53-1	Deflection Block	1

Part No.	Description	Q'ty
1-453-002-11	High Voltage Block	1
1-451-005-13	Deflection Yoke	1

Mechanical Parts List

Part No.	Description	Q'ty
	A. General	
	Cabinet & Appearance Items	
X-40032-02-2	Picture Tube Mask Assembly, including	1
4-003-204-02	Picture Tube Mask	(1)
-205-01	" SONY " Badge	(1)
-206-01	Picture Tube Fixing Bracket (left)	(2)
-207-01	〃 〃 〃 〃 (right)	(2)
X-40032-25-1	Control Panel (V) Assembly, including	1
4-003-208-01	Control Panel Mounter	(1)
-286-01	Control Panel (V)	(1)
-213-01	Control Panel Mounter Holding Bracket	(2)
4-003-214-01	Picture Tube Protector	1
-215-02	Dust-proof Rubber	1
-216-02	Picture Tube Holding Ring	1

Part No.	Description	Q'ty
X-40032-04-1	Picture Tube Holding Bracket Assembly, including	4
4-003-217-01	Picture Tube Holding Bracket	(4)
-218-01	Cushion for Picture Tube Holding Bracket	(4)
4-003-219-01	Cushion for Picture Tube	1
-220-01	Grounding Spring	1
X-40032-05-1	Cabinet Assembly	1
X-40032-06-3	Grip Handle Assembly, including	1
4-003-223-02	Grip Handle	(1)
-224-01	Ornamental Leather for Grip Handle	(1)
-227-03	Felt for Grip Handle	(2)
4-003-233-01	Grip Handle Receptacle	2
-225-01	Grip Handle Bearing (left)	1
-226-01	〃 〃 〃 (right)	1
-228-01	Speaker Grille	1

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Part No.	Description	Q'ty
4-003-329-02	Speaker Holding Nut	4
X-40032-83-1	Telescopic Antenna Assembly, including	1
X-40026-71-1	Telescopic Antenna Sub-Assembly	(1)
4-002-840-01	Telescopic Antenna Ball	(1)
-841-01	Telescopic Antenna Ball Receptacle	(1)
-842-01	Telescopic Antenna Spring	(1)
-843-01	Special Washer	(2)
-844-01	Telescopic Antenna Supporter	(1)
-845-01	Telescopic Antenna Fixing Shaft	(1)
-717-00	Telescopic Antenna Bottom Insulator	(1)
4-003-343-01	Telescopic Antenna Holder	(1)
-232-03	Telescopic Antenna Washer	(1)
-334-01	Telescopic Antenna Lug	(1)
7-623-112-11	Washer 5φ (medium)	(1)
-412-02	Star Washer 5φ	(1)
4-002-727-00	Telescopic Antenna Holding Nut 5φ	(1)
-728-00	Lock Nut for Telescopic Antenna 5φ	(1)
4-003-342-01	Telescopic Antenna Bushing	1
-346-01	Telescopic Antenna Catch	1
X-40034-05-1	Front Cover Assembly, including	1
4-003-347-01	Front Cover	(1)
-405-01	Front Cover Badge	(1)
4-003-239-01	Adjustment Hole Cover	1
-240-01	Bottom Cover	1
-241-01	Circuit Board Holding Bracket	1
X-40032-03-2	Table Stand Assembly, including	2
4-003-242-02	Table Stand	(2)
-243-02	Reinforcing Plate for Table Stand	(2)
X-40032-31-1	Back Cover Assembly, including	1
4-003-244-03	Back Cover	(1)
-401-02	Name Plate	(1)
4-002-816-01	Badge No. Label	1/10
X-40034-01-1	Channel Selector Knob Assembly, including	1
4-003-402-01	Channel Selector Knob	(1)
-403-01	Channel Selector Indicating Plate	(1)
-017-01	Channel Selector Knob Spring	(1)
X-40032-27-1	Fine Tuning Knob Assembly, including	1
4-003-291-01	Fine Tuning Knob	(1)
4-001-084-01	Fine Tuning Knob Spring	(1)
X-40032-13-1	Control Knob Assembly, including	4
4-003-251-01	Control Knob	(4)
-252-01	Control Knob Spring	(4)
X-40032-14-1	Volume Control Knob Assembly, including	1
4-003-253-01	Volume Control Knob	(1)
-254-01	Volume Control Knob Panel	(1)
-252-01	Volume Control Knob Spring	(1)
4-003-345-01	Packing for Volume Control Knob	5
	Main Block	
X-40032-15-1	Chassis Assembly, including	1
4-003-256-01	Chassis	(1)
-257-01	Adjustable Clamp for Electrolytic Capacitor (large)	(1)
4-003-259-01	Multi-Jack Holding Bracket	1
-260-01	Adjustable Clamp for Electrolytic Capacitor (small)	
-261-01	Volume Control Holding Plate	1
-292-01	Tuner Holding Bracket	1
-293-01	Pilot Lamp Holder	1
	Video & Sound Signal Block	
4-003-330-01	Shielded Plate for Video & Sound Signal Circuit Board	1

Part No.	Description	Q'ty
4-003-344-02	Rubber Bushing for Video & Sound Signal Circuit Board	2
	Deflection Block	
X-40032-01-1	Deflection Circuit Board Assembly, including	1
4-003-201-01	Heat Sink for Hor. Power Transistor	(1)
-202-01	Heat Sink for Vert. Power Transistor	(1)
-203-01	Spacer for Heat Sink	(1)
4-002-107-01	Heat Sink for Hor. Driver Transistor	(1)
	Accessory	
4-003-277-01	Styro-foam Cushion (left)	1
-278-01	〃 〃 (right)	1
-406-01	Master Carton (for 2 sets)	1
-404-01	Carton for Cabinet	1
4-002-770-00	Polyethylene Bag	1
4-495-032-10	Instruction Manual	1
X-44900-02-1	Silicone Cloth (in Polyethylene Bag)	1
4-490-012-00	Polyethylene Bag	(1)
3-998-911-01	Silicone Cloth	(1)

B. Screws & Washers

(Minimum Q'ty for Ordering : 100 pcs.)

Cabinet & Appearance Items

Screw

⊕K 2.6φ×10 (for Telescopic Antenna Catch)	1
⊕B 3φ×8 (for Picture Tube Mask (4), Control Panel Mounter (2), Table Stand (2))	8
⊕P 3φ×8 (for Chassis)	2
⊕B 3φ×10 (for Speaker)	4
⊕P 3φ×6 (for Video & Sound Signal Circuit Board (1), Picture Tube (4), Table Stand (2), Telescopic Antenna (2))	9
⊕B 2.6φ×6 (External Antenna Jack)	1
⊕P 3φ×50 (for Picture Tube)	1

Self Tapping Screw

⊕R 3φ×8 (for Chassis (2), Circuit Board Holding Bracket (1), Deflection Circuit Board (2), Bottom Cover (4))	9
⊕R 3φ×10 (for Table Stand)	4
⊕R 3φ×12 (for Bottom Cover)	5

Star Washer

2.6φ (for Telescopic Antenna Catch	1
6φ (for Grip Handle)	2

Washer

3φ (medium) (for Back Cover (5), Picture Tube (1))	6

Spring Washer

3φ (for Picture Tube)	4

Nut

2.6φ (for Telescopic Antenna Catch)	1
3φ (for Picture Tube (2), Table Stand (2))	4
6φ (for Grip Handle)	2

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Part No.	Description	Q'ty
	Main Block	
	Screws	
7-621-261-42	⊕ P 3φ×6 (for Tuner, Pilot Lamp Holder, Volume Control Holding Plate, Power Transformer, Adjustable Clamp for Electrolytic Capacitor, High Voltage Block, Multi-Jack, 4P Plug, Charging Switch)	18
-261-22	⊕ P 3φ×4 (for Tuner)	3
-52	⊕ P 3φ×8 (for Signal Circuit Board)	2
-62	⊕ P 3φ×10 (for Electrolytic Capacitor)	1
4-002-737-01	⊕ P 3φ×23 (for Selenium Rectifier)	1
	Spring Washers	
7-623-208-21	3φ (for Tuner, Pilot Lamp Holder, Volume Control Holding Plate, High Voltage Block, Adjustable Clamp for Electrolytic Capacitor, Power Transformer, Multi-Jack, Charging Switch)	18
	Lock Washer	
7-623-408-01	3φ (for Selenium Rectifier)	1
	Washer	
7-623-108-12	3φ (for Signal Circuit Board)	2
	Deflection Block	
	Screws	
7-621-261-62	⊕ P 3φ×10 (for Transistor)	4
-72	⊕ P 3φ×12 (for Transistor)	2
-255-52	⊕ P 2φ×8 (for Transistor)	2
-261-32	⊕ P 3φ×5 (for Heat Sink)	1
	Lock Washers	
7-623-408-01	3φ (for Transistor, Heat Sink)	7
-405-01	2φ (for Transistor)	2
	Nuts	
7-622-308-01	3φ (for Transistor)	6
-305-01	2φ (for Transistor)	2
	Lug	
7-623-508-01	3φ (for Heat Sink)	1

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